

The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 66 Number 5

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THE JOURNAL OF THE Society of Dyers and Colourists

Volume 66—Number 5

MAY 1950

Issued Monthly

Proceedings of the Society

Annual General Meeting

The Sixty-sixth Annual General Meeting of the Society of Dyers and Colourists was held at the Queens Hotel, Leeds, on Friday, 31st March 1950, at 5.15 p.m., the President (Mr. George E. Holden) being in the chair, and about fifty members of the Society being present.

The General Secretary (Dr. C. J. W. HOOPER) read the minutes of the Sixty-fifth Annual General Meeting, which were accepted as a correct record on the motion of Mr. F. SMITH seconded by Mr. F. ATTACK.

REPORT OF THE COUNCIL

Council is pleased to report that the activities of the Society have been well maintained, and in certain directions extended, during the year ended 31st December 1949. The net increase in membership is about 150.

The Society regrets to record the loss by death of six members, including Mr. V. H. Majerus, who had served on the Publications Committee for seventeen years, and Professor L. A. Olney, Emeritus President of the American Association of Textile Chemists and Colorists. The death of Dr. F. Townend shortly after the termination of his very valuable services as Honorary Secretary of the Manchester Section came as a great shock to his many friends in the Society.

The kindly personality of the President of the Society, Mr. G. E. Holden, has again greatly contributed to the smooth running of Council meetings, and Council extends its sincere congratulations to Mr. Holden on the award to him of the C.B.E., announced in the New Year Honours List for 1950.

At the Annual General Meeting the office of President-elect was created, and Council is gratified that Mr. F. Scholfield has accepted their invitation to this new office.

The Sections have well maintained their activities; interesting series of meetings have been held, which have been well attended. Nearly all the Sections have now prepared bye-laws, and these have been approved by Council.

Active co-operation between the Textile Institute and the Society has continued during the year, and contact with local sections of the Institute and other similar bodies, such as the Royal Institute of Chemistry, in related fields of interest, has been

maintained by the holding of joint meetings with the local sections of the Society, and in many cases by the publication of joint programmes of meetings.

Mr. E. A. Swift was welcomed as the representative of the Society at the Annual Conference of the Association des Chimistes de l'Industrie Textile in Lyon.

PUBLICATIONS COMMITTEE—This Committee has been most active during the year under the chairmanship of Mr. C. L. Bird, with Mr. J. V. Summersgill as Honorary Secretary, and Mr. Bird's previous experience as Editor of the *Journal* has proved of great value. The standard of lectures and communications in the *Journal* has continued high. The large amount of matter received for publication, including the Symposium on Photochemistry in relation to Textiles, which appeared in the December issue, together with the employment of larger type than in 1948 for communications, lectures, etc., has led to a larger number of pages in 1949 than in the largest pre-war volume. The amount of material coming forward for publication indicates the virile nature of the *Journal*, but it has led to some delay in publication, which has been a source of anxiety to the Committee. By publishing larger issues of the *Journal* it is hoped to reduce this delay to not more than four months. This increase in the amount of published matter has led to increased *Journal* charges, and these are receiving the close attention of the Finance Committee. During the year arrangements were made for a new format of the *Journal*, to commence in January 1950, the major change consisting in a cover free from advertisement and containing the list of contents. This change in format has caused a general rearrangement of the advertisements, and Council is pleased to place on record the good relationships which have always existed between our advertisers and the Society and the happy co-operation evinced during these changes.

The photolithographic reproduction of the first edition of the *Colour Index*, the second edition of *Identification of Dyes on Textile Fibres* by E. Clayton, the second impression of *The Theory and Practice of Wool Dyeing* by C. L. Bird, and the *Symposium on the Theory and Practice of Dyeing* have all met with a steady demand during the past year.

Balance Sheet as at 31st December 1949

<i>31.12.48</i>	SURPLUS AND LIABILITIES	£	s.	d.	<i>31.12.48</i>	ASSETS	£	s.	d.
	SURPLUS — DEVELOPMENT					DEVELOPMENT ACCOUNT INVESTMENTS			
	Balance of Accumulated Funds				<i>13,239</i>	As per Schedule (at cost) ...			<i>15,899 10</i>
<i>18,186</i>	as per Appropriation Account	<i>18,644</i>	<i>17</i>	<i>6</i>		(Market Value — £14,530) ...			
<i>1,818</i>	FOUNDATION FUND	<i>1,818</i>	<i>7</i>	<i>0</i>		FOUNDATION FUND INVESTMENTS			
<i>100</i>	KNECHT MEMORIAL FUND	<i>100</i>	<i>0</i>	<i>0</i>	<i>1,818</i>	As per Schedule (at cost) ...			<i>1,818 7</i>
<i>2,000</i>	GEORGE DOUGLAS LECTURE FUND	<i>2,000</i>	<i>0</i>	<i>0</i>		(Market Value — £1,815) ...			
	AMOUNTS RECEIVED IN ADVANCE					KNECHT MEMORIAL FUND INVESTMENTS			
<i>123</i>	Subscriptions	<i>154</i>	<i>0</i>	<i>6</i>	<i>100</i>	As per Schedule (at cost) ...			<i>100 0</i>
—	Light Symposium Orders ...	<i>175</i>	<i>0</i>	<i>0</i>		(Market Value — £94) ...			
	CURRENT LIABILITIES				<i>2,000</i>	GEORGE DOUGLAS LECTURE FUND INVESTMENTS			
<i>1,245</i>	Sundry Creditors per Schedule	<i>2,441</i>	<i>8</i>	<i>0</i>		As per Schedule (at cost) ...			<i>2,000 0</i>
						(Market Value — £1,781)			
						CURRENT ASSETS			
					<i>8</i>	Cash in Hand	<i>33</i>	<i>4</i>	<i>2</i>
					<i>2,748</i>	Cash in Bank	<i>2,611</i>	<i>12</i>	<i>0</i>
					<i>1,658</i>	Debtors per Schedule	<i>2,066</i>	<i>0</i>	<i>5</i>
					<i>1,349</i>	Stocks per Schedule	<i>757</i>	<i>17</i>	<i>2</i>
					<i>5,763</i>				<i>5,469 2</i>
						FIXED ASSETS			
						Furniture and Equipment per			
					<i>421</i>	Schedule			
					<i>131</i>	General	<i>428</i>	<i>12</i>	<i>6</i>
						New Colour Index	<i>118</i>	<i>0</i>	<i>0</i>
					<i>552</i>				<i>546 12</i>
<i>£23,472</i>		<i>£25,393</i>	<i>13</i>	<i>0</i>	<i>£23,472</i>				<i>£25,393 13</i>

H. JENNISON, *Honorary Treasurer*
JOHN BARRITT, *Honorary Secretary*

AUDITORS' REPORT

We have examined the above Balance Sheet with the Books and Documents of the Society produced to us.
In our opinion the above Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs according to the best of our information and the explanations given to us and as shown by the Books of the Society.

18th January 1950
Bradford

RAWLINSON, GREAVES & MITCHELL
*Chartered Accountants
Auditors*

GENERAL REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1949

31.12.48	EXPENDITURE	£	s.	d.	31.12.48	INCOME	£	s.	d.
	To GENERAL OFFICE					By SUBSCRIPTIONS			
425	Printing and Stationery ...	350	19	7	4,331	Members ...	4,541	13	11
203	Postages ...	142	14	3	70	Juniors ...	63	0	0
1,287	Salaries and Wages ...	1,368	6	4					
313	Rents, Rates, and Insurances ...	314	5	7	4,401				4,604 13
54	Electricity and Heating ...	56	11	9		JOURNAL ACCOUNT			
90	Telephone ...	119	10	5		Sale of Journals ...	2,204	15	0
92	Legal Charges (re Charter) ...	-	-	-	2,528	Advertisements ...	4,044	9	7
21	Bank Charges ...	19	12	0	4,090	Reprints ...	101	15	11
	Investment Charges (Midland Bank Executor & Trustee Co. Ltd.) ...	51	3	6	133				
95	Audit and Accountancy ...	98	14	0	6,751	STOCK			6,851 0
429	Sundry Expenses ...	392	17	0	228	Increase in Stock of Journals			43 6
					102	DONATIONS ...			102 2
3,141		2,854	14	5	359	DIVIDENDS ON INVESTMENTS (Gross)			406 14
180	Less Allocation to New Colour Index ...	180	0	0		PREMIUM ON CONVERSION Less NET LOSS ON SALES OF INVESTMENTS			-
2,961					4	GERMAN TRIP FUND MONIES			-
595	EXPENDITURE—Fibrous Proteins				15				
47	SECTIONAL EXPENSES ...								
30	DEPRECIATION ON GENERAL OFFICE FURNITURE ...								
20	MERCER LECTURE EXPENSES ...	46	6	3					
	Less Donation ...	20	0	0					
10									
4,476	JOURNAL								
	Printing and Publishing (includes costs of Light Symposium) ...	5,710	0	4					
314	Postages ...	371	6	10					
533	Editorial Charges ...	898	2	2					
6	Foreign Journals ...	-	-	-					
2	Own Journals ...	110	8	2					
197	Abstractors' Fees ...	281	7	7					
34	Book Reviews ...	55	10	4					
5,612									
74	ANNUAL MEETING AND DINNER								
10	DONATIONS AND SUBSCRIPTIONS								
12	REPAIRS AND RENEWALS								
	SURPLUS FOR THE YEAR TO APPROPRIATION ACCOUNT								
2,536									
£11,860									
		£11,507	17	3	£11,860				£11,507 11

ACCUMULATION AND APPROPRIATION ACCOUNT—YEAR TO 31ST DECEMBER 1949

			£	s.	d.	£	s.	d.	31.12.48		£	s.	d.	£	s.	d.
										By BALANCES AT 1ST JANUARY 1949						
									7,265	General Account	10,048	17	4			
									3,466	Accumulated Subscriptions and						
									130	Donations from Appeal	3,556	11	2			
									95	Fastness Tests	156	13	7½			
									474	Identification of Dyes	140	15	0½			
									2,483	Wool Dyeing	812	2	0½			
									13,913	Dyeing Symposium	275	2	11½			
									—	Colour Index and Supplement	5,082	17	6½			
									196		20,073	0	2½			
									13,717	Less Accumulated Expenditure	1,886	12	8½			
										on New Colour Index						
										Dyeing Symposium Balance						
			</													

SCHEDULE OF DEVELOPMENT ACCOUNT INVESTMENTS

	Balances 1948		Alterations	Balances 1949		Market Values	
	£	s. d.		£	s. d.	1949 £	1948 £
Leeds Permanent Building Society — Deposit Account D3403	494	2 6	Account closed — reinvested in Southern Rhodesia	—	—	—	494
£2,763 3s. 8d. 3% British Transport Guaranteed Stock 1978/88	2,598	17 0		2,598	17 0	2,480	2,763
£750 2½% National War Bonds 1940/51	750	0 0		750	0 0	760	756
£546 3½% Conversion Loan	557	0 0		557	0 0	511	581
£1,255 2½% National Defence Bonds	1,255	0 0		1,255	0 0	1,255	1,255
£2,749 16s. 0d. 3% Savings Bonds 1960/70	2,750	0 0		2,750	0 0	2,660	2,846
£750 1½% Exchequer Bonds 1950	750	0 0	To be converted to £750 2½% Exchequer Bonds in Feb. 1950	750	0 0	751	756
500 National Savings Certificates 15s. units	375	0 0		375	0 0	375	375
£2,000 3% British Gas Stock 1990/95	—	—	Purchased during year	2,000	0 0	1,778	—
£2,017 11s. 6d. 3% Treasury Stock 1966 or after	1,957	1 0		1,957	1 0	1,675	1,977
£1,500 12s. 9d. 3% British Electricity Guaranteed Stock 1968/73	1,495	19 0		1,495	19 0	1,429	1,546
£100 3% Southern Rhodesia Stock 1971/73	100	0 0	£801 3s. 6d. purchased during the year	100	0 0	95	101
Midland Bank Executor and Trustee Co. Ltd. Cash awaiting Investment	158	7 6		810	13 9	761	—
	£13,239	7 0		£15,399	10 9	£14,530	£13,606

SUNDRY ACCOUNTS FOR THE YEAR ENDED 31ST DECEMBER 1949

EXPENDITURE				FASTNESS TESTS				INCOME								
				£	s.	d.					£	s.	d.	£	s.	d.
To	STOCK OF CLOTH 1ST JANUARY 1949	...	...	...	150	0	0	By	SALES	...	...	...	...	10	10	0
"	EXPENSES FOR THE YEAR	...	...	...	254	13	11		Crockmeter	...	...	...	...	236	17	3
"	PROFIT TO APPROPRIATION ACCOUNT	...	...	...	25	8	3		Bunches	...	...	...	...	21	16	4
									Reports	...	...	...	...			269 3 7
								"	STOCK OF CLOTH —							
									31st December 1949	...	...	...				160 18 7
					£430	2	2									£430 2 2

										"IDENTIFICATION OF DYES"																			
EXPENDITURE																				INCOME									
										£ s. d.																			
To	STOCK 1ST JANUARY 1949	...	...	...	...	...	...	...	...	30	9	6	By	SALES	...	...	...	...	...	...	...	...	...	65	15	3			
10	PRINTING	...	...	...	...	...	...	...	...				"	STOCK 31ST DECEMBER 1949	...	...	...	...	...	...	...	...	...	1	0	10			
10	SUNDRY EXPENSES	...	...	...	...	...	...	...	...	2	11	10½																	
10	PROFIT TO APPROPRIATION ACCOUNT	...	...	...	...	...	...	...	...	34	0	8½																	
										£67 2 1																			
																				£67 2 1									

				"WOOL DYEING"						
EXPENDITURE						INCOME				
				£	s. d.					
To	STOCK 1ST JANUARY 1949	153	0 0	By	SALES	155 16 10
By	SUNDRY EXPENSES AND ROYALTIES	19	8 5½	"	STOCK 31ST DECEMBER 1949	28 10 0
By	PROFIT TO APPROPRIATION ACCOUNT	...	...	11	18 4½				
				<hr/>						
				£184	6 10					
				<hr/>						
				£184	6 10					

		"REPLIKA" COLOUR INDEX AND SUPPLEMENT					
EXPENDITURE		£ s. d.		£ s. d.		INCOME	
						£ s. d.	
To STOCK AT 1st JANUARY 1940							
	Index	397	7 4				
	Supplement	79	7 0	476	14 4		
"	PRINTING AND BINDING						
	Index and Supplement			263	10 3		
"	SUNDRY EXPENSES						
	Index and Supplement			37	1 4		
"	PROFIT TO APPROPRIATION ACCOUNT			303	8 1		
				£1,080	14 0		
						£1,080	14 0

EXPENDITURE				NEW COLOUR INDEX				INCOME					
				£	s.	d.	£	s.	d.				
To EXPENSES										By BALANCE TO APPROPRIATION ACCOUNT			
Wages and Expenses				149	10	8				698 4 9½			
Sundry Expenses				67	6	3½							
Printing and Stationery				247	14	4							
Meetings Expenses				40	10	11	505	2	2½				
GENERAL EXPENSES													
Proportion allocated from General Revenue Account for the year ...							180	0	0				
DEPRECIATION ON OFFICE FURNITURE							13	2	1				
							£698	4	3½				£698 4 9½

DYEING SYMPOSIUM				INCOME			
EXPENDITURE							
	£	s.	d.		£	s.	d.
STOCK ON HAND 1ST JANUARY 1949	38	7	4	By RECEIPTS	52	19	4
PRINTING AND STATIONERY				" STOCK — 31ST DECEMBER 1949	11	8	0
POSTAGES AND SUNDRY EXPENSES	3	5	8½				
PROFIT TO APPROPRIATION ACCOUNT	22	14	3½				
	<u>£64</u>	<u>7</u>	<u>4</u>		<u>£64</u>	<u>7</u>	<u>4</u>
LIGHT SYMPOSIUM				INCOME			
EXPENDITURE							
	£	s.	d.		£	s.	d.
PRINTING AND STATIONERY	49	5	6	By RECEIPTS			
DINNER	209	18	3	Preprints	219	4	4
EXCURSIONS	25	13	6	Bound Volume (reserved below)	175	0	0
SUNDRIES	21	17	5	Dinner	159	0	0
				Excursions	33	5	3
SURPLUS TO APPROPRIATION ACCOUNT			104	14	586	9	7
(NOTE—This is subject to printing costs included in Journal costs for December 1949)							
RESERVE for amounts received in advance			175	0			
			<u>£586</u>	<u>9</u>	<u>7</u>		
GEORGE DOUGLAS LECTURE FUND				LECTURE ACCOUNT			
EXPENDITURE				INCOME			
	£	s.	d.		£	s.	d.
LECTURER'S FEE, LECTURE HALL, PRINTING, ADVERTISING, AND INCIDENTAL EXPENSES	68	14	11	By INTEREST ON INVESTMENTS	29	15	1
SURPLUS TO APPROPRIATION ACCOUNT	29	15	1	" CONTRIBUTION FROM BRADFORD DYERS' ASSOCIATION LTD.	68	14	11
	<u>£98</u>	<u>10</u>	<u>0</u>		<u>£98</u>	<u>10</u>	<u>0</u>

Council wishes to express its gratitude to all those who have contributed to the production of the *Journal*, notably the authors of papers, abstractors, referees, and Mr. C. O. Clark as editor of the abstracts of patents.

NEW "COLOUR INDEX"—During the year certain important changes have been made in the composition of the *Colour Index* Editorial Panel. Following the resignation of Mr. H. H. Bowen, referred to in the last Annual Report, Mr. J. Barritt was elected Chairman and Mr. H. Blackshaw Co-ordinator and Vice-chairman. Mr. C. O. Clark joined the Panel to take over the editorial work previously allocated to Mr. H. H. Bowen.

Owing to increased business responsibilities Dr. J. S. Heaton found it necessary to resign from the Panel during the year. Dr. Heaton was an esteemed member of the Panel and made a substantial contribution to its work. The Panel has been fortunate in being able to arrange for Mr. R. J. Hannay to take over Dr. Heaton's editorial work.

The Panel has been increased to a total of nine by the appointment of Professor W. Bradley and Mr. J. G. Grundy.

Co-operation with dyemakers has been maintained on a satisfactory basis. Whilst firms are desirous of giving the information required, it has not been possible in all cases for them to submit material at a rate which the Panel considers desirable. Whilst the Panel appreciates the difficulties with which the various firms are faced, it is hoped that in 1950 it will be possible for them to accelerate the pace of their co-operation. The Panel is taking all possible steps to speed this up, and attaches great importance to the completion of the editorial work at the earliest possible date.

Our relations with the American Association of Textile Chemists and Colorists have been maintained on a very cordial and satisfactory basis.

During the year it was a pleasure to discuss the work with representatives of Swiss and French dyemakers who attended the Symposium in Harrogate.

Council again records its indebtedness to the firms and institutions who have enabled the members of the Panel to devote so much of their time to this work.

FASTNESS TESTS COMMITTEE—The Committee has met twice during the year, to consider, in the light of criticisms which have been received, modifications of certain of the tests published in its Second Report, notably those for fastness to Alkaline Milling, Burnt Gas Fumes, and Cellulose Ester Bonding, and a considerable amount of experimental work has been carried out. A tentative grey scale has been prepared and discussed. A start has been made with the discussion of work on the international standardisation of fastness tests in co-operation with the British Standards Institution, the International Standards Organisation, and the American Association of Textile Chemists and Colorists.

Arrangements have been completed in the course of the year for the manufacture in this country of the Crockmeter and the Wash Wheel, supplies of various standard cloths for use in the tests are now available, and work has continued on the provision of bunches for light-fastness testing (B.S.1006: Part 2) for sale by B.S.I. An amendment to B.S. 1006: Part 1 has been approved by the Committee.

LEATHER DYES COMMITTEE—The report of this Committee was published in the July issues of both the Society's *Journal* and the *Journal of the Society of Leather Trades' Chemists*. Arrangements have been made by the Society for the supply of leather prepared in a standard manner for use in making the recommended tests.

VAT DYES COMMITTEE—This Committee has held seven meetings during the course of the year, and tests are now being carried out on all the principal cellulosic fibres.

WOOL DYES COMMITTEE—The Committee concluded its discussions in January 1949. Since then a range of acid wool dyes has been subjected to the proposed tests, and a full report will shortly be submitted to Council.

DYEING AFFINITY OF REGENERATED CELLULOSE COMMITTEE—The Committee has made arrangements for the production of specially modified rayon yarn, on which dyeing affinity experiments are being carried out.

PRESERVATION OF HISTORICAL RECORDS COMMITTEE—During the year the Committee, either through gift or by purchase, has obtained further interesting items. Information is being collected on the location of historical material available for study. Council would be grateful if members would contribute to the work of the Committee either by gift of material of historical value or by useful information.

TERMS AND DEFINITIONS COMMITTEE—A Terms and Definitions Committee has been set up by Council in the course of the year, and preliminary arrangements have been made for the organisation of its work.

ANNUAL REVIEWS OF TEXTILE PROGRESS—This joint project with the Textile Institute is now well advanced, and it is hoped to publish the first volume early in 1950.

MOTH AND DERMESTID BEETLE PROOFING COMMITTEE—The work during the year has been confined to that carried out by the Larval Test Subcommittee, which is active in an attempt to devise an appropriate method for larval testing. The members of this committee have carried out a considerable amount of work, but, as was anticipated at the outset, the problem to be solved is a difficult one.

THE WORSHIPFUL COMPANY OF DYERS' RESEARCH MEDAL—Council thanks the Adjudication Committee, with Mr. R. J. Hannay as Convener, for its work in reviewing papers published from July 1948 to June 1949, as a result of which the Court of the Worshipful Company of Dyers has approved the Committee's recommendation that the Company's Gold Medal be awarded to Dr. H. Lindley as the author who has most substantially contributed to the paper *The Mechanism of Set and Supercontraction in Wool Fibres*, by S. Blackburn and H. Lindley (J.S.D.C., 64, 305 (Sept. 1948)).

The Company has reverted to an earlier ceremony of presenting its medals at a dinner of the Court and Livery of the Company, a compliment which is greatly appreciated by both Council and the recipients. Thus, on 6th April 1949, medals were presented to Mr. J. Boulton and Mr. J. M. Preston, for 1943-44 and 1947-48 respectively.

THE SOCIETY'S MEDAL ADJUDICATION COMMITTEE—On the recommendation of the Committee the Council has awarded the Gold Medal to Dr. S. M. Neale, and extends its warmest congratulations to him. The citation in respect of the

medal appears in the January 1950 issue of the *Journal* (p. 7).

WORSHIPFUL COMPANY OF FELTMAKERS' RESEARCH MEDAL—Both Council and the Committee greatly regret that again no paper qualifying for the award has been published in the *Journal* during the period July 1948 to June 1949, and hope very much that work of a suitable nature will be published in the near future.

MERCER LECTURE—The Sixth Mercer Lecture, on *Some Applications of Chemistry to Textile Finishing*, was delivered by Mr. E. Wilson in London on 20th May 1949. Members of other scientific bodies were invited to attend, and the President was in the chair. A large audience listened with great interest to the lecture, which was illustrated by a collection of fabrics.

GEORGE DOUGLAS LECTURE—The First George Douglas Lecture, on *George Douglas, his Times, and some Thoughts on the Future*, was delivered by Dr. H. Levinstein in Bradford on 10th February 1949, the President in the chair. The Bradford Dyers' Association Ltd. had very kindly invited Dr. Levinstein, leading local personalities including the Lord Mayor of Bradford, and officers of the Society to dinner before the lecture, and Mr. James Ewing (Chairman of the Association) prefaced the lecture by a brief explanation of the objects of the Association in enabling the Society to institute the George Douglas Lecture. There was a large audience of members of this and other societies, who had been invited to attend. A very interesting account was given of some of the persons concerned in the early history of the dyemaking industry in this country and Germany, and of the conditions which influenced developments. A vote of thanks to the lecturer was proposed by Mr. J. Foster Beaver (President of the Textile Institute) and seconded by Professor J. B. Speakman.

ANNUAL DINNER—The Sixty-fifth Annual Dinner was held at the Central Hotel, Glasgow, on March 25th, this being the first time that the Society had held its Annual Dinner in Scotland. The principal guest was Mr. R. A. Maclean (Chairman of the Scottish Industries Exhibition), and a large number of other distinguished guests were present. The Gold Medal of the Society was presented to Mr. G. G. Hopkinson, and the Silver Medal to Mr. D. B. F. McAndrew.

SYMPOSIUM ON PHOTOCHEMISTRY IN RELATION TO TEXTILES—This symposium was held at Harrogate during September and proved to be most successful. Discussion of the twenty-six papers, which had been circulated as preprints and will shortly be available as a bound volume, was lively and sustained, the sessions being of both academic and practical interest. The attendance was approximately 250-300, including twenty-three overseas visitors. The social programme included a Civic Reception in the Lounge Hall and the Society's Symposium Dinner at the Grand Hotel. A programme of excursions to places of interest in the neighbourhood of Harrogate was greatly appreciated by the ladies accompanying those taking part in the symposium. The Society is deeply indebted to the Harrogate Municipal

Authorities for their very great help in making detailed arrangements and providing accommodation for the meetings.

FINANCE COMMITTEE—The Committee met frequently during the year. It has been faced with the problem of increasing costs, especially with respect to the *Journal*. As will be seen from the balance sheet, there is a surplus on the year's working.

SOCIETY OF DYERS AND COLOURISTS OF AUSTRALIA—Council extends cordial greetings to the S.D.C. of Australia, and congratulates this Society on its recent developments, which include the adoption of a new constitution and the formation of a new section in South Australia.

REPRESENTATIVES ON EXTERNAL BODIES—Council records its appreciation of the work undertaken by the various members who represent the Society on a number of external bodies, details of which will be found in the January issue of the *Journal* (p. 3).

Among bodies formed during the past year are the Chemical Symbols and Abbreviations, Colour Terminology, and Rubber-Proofed Standards committees of the British Standards Institution, on which the Society is represented by the Editor, Mr. H. W. Ellis, and Mr. R. J. Hannay respectively; and the British Biological Stains Commission, on which the Society's representative is Professor W. Bradley.

Council is deeply indebted to Mr. R. Conchar of Messrs. John Conchar & Co., Honorary Solicitors to the Society, who has spent considerable time and energy on the various legal questions which have arisen in the conduct of the Society's business.

Council records its appreciation of various donations made throughout the year.

This Report cannot fully indicate the scope of the Society's activities, some of which are to be found in the January issue of the *Journal*, and still less can it detail the contributions made by so many individual members. Council wishes to thank all these members, and believes that the continued prosperity of the Society provides the real satisfaction which accrues to members of a corporate body which relies on voluntary service.

During the year Mr. K. H. Helm resigned to take up another appointment and Mr. E. Illingworth was appointed to succeed him as Assistant Secretary in July. Mr. Helm carries with him the good wishes of Council in his new work. The Council welcomes Mr. Illingworth and appreciates the good work he and all members of the office staff are doing. Finally, Council records its appreciation of the sustained efforts of Dr. Hooper as Editor and General Secretary during a busy year which included the very successful Symposium in Harrogate.

The Honorary Secretary (Mr. J. BARRITT), in moving the adoption of the Annual Report, pointed out that the Report and Accounts had been in members' hands for a month. The Society had had a busy and successful year, but there was a need for more members, especially young members.

The new *Journal* cover had been well received, and advertisers had shown their goodwill by their co-operation in the changes involved. Abundance of matter had led to some delay in publication, but this was now being successfully dealt with.

Steady progress was being made on the second edition of the *Colour Index*, though the task was proving bigger than had been envisaged at the outset. Generous support was being received from dyemakers and institutions in this work. Negotiations for an agreement with the American Association of Textile Chemists and Colorists were proceeding satisfactorily, and the most cordial relationship existed between the two bodies.

The Harrogate Symposium on Photochemistry in relation to Textiles had been most successful, in respect of both papers and social activities, and a number of visitors from overseas had greatly enjoyed the meeting.

The widespread activities of the Society, a measure of the willing service rendered by so many members, were indicated by the rest of the Report.

The staff under Dr. C. J. W. Hooper were a loyal and happy band, and the latest recruit, Mr. E. Illingworth, was settling down very well as Assistant Secretary, as evidenced by his detailed work in organising the Dinner that evening.

Finally, Mr. Barritt said how pleasant it had been to serve under Mr. Holden as President, and how pleased all members had been when the C.B.E. had been conferred on Mr. Holden.

Dr. P. W. CUNLIFFE seconded the resolution, which was carried.

ANNUAL ACCOUNTS

The Honorary Treasurer (Mr. H. JENNISON), in submitting the Annual Balance Sheet, copies of which had been sent to members a month earlier, pointed out that there had been a slight increase, of £586, in the accumulated funds of the Society. Among donations, the Society was again grateful to Messrs. Imperial Chemical Industries Ltd. for £100. Stocks of the Society's publications had gone down, but arrangements had been made for reprinting them where necessary. A further £2000 had been invested, in British Gas Stock. The market value of earlier investments was down, but this did not affect the yield on the original sum invested. The Light (Photochemistry) Symposium showed a surplus of £104, but this took no account of the cost of typesetting the symposium papers, which contributed to the increased cost of producing the *Journal*; it was intended that any final surplus remaining after sale of the bound symposium volumes would be credited to the *Journal* account. The Society was indebted to Messrs. The Bradford Dyers' Association Ltd. for defraying the cost of the first George Douglas lecture, thus enabling funds to accumulate for the second lecture. In view of the generally satisfactory state of the Society's finances shown by the Statement of Accounts and Balance Sheet, Mr. Jennison had great pleasure in moving their adoption.

Mr. F. L. GOODALL seconded the adoption of the Balance Sheet, which was carried.

ELECTION OF PRESIDENT

Mr. G. E. HOLDEN moved the election of Mr. Fred Scholefield, who had been nominated by the Council, as President of the Society. He had known Mr. Scholefield, who was a brilliant chemist and dyer and a valuable member of the Society, for a long time. He was sure that, with the assistance of the Society's officers, Mr. Scholefield would be an excellent President, and he had the greatest possible pleasure in moving his election.

Dr. C. M. WHITTAKER said it was a very pleasant task to second the proposal to elect his old friend as President for the ensuing year. He was sure that it must be a source of great satisfaction to Mr. Scholefield that his election to this high office should take place in his native city, at the university of which he had received his degree in the science and art of dyeing. After some temporary wanderings elsewhere he had settled down in Lancashire, and in due course had become manager of one of the largest skein and warp dye-houses in Lancashire, which position he had subsequently left to become Head of the Textile Chemistry Department of the Manchester College of Technology. He had thus had both practical and academic experience of the craft, and was therefore doubly qualified to be President.

The motion was carried with acclamation.

At this point Mr. SCHOLEFIELD occupied the chair. He expressed his feeling of pride at the honour conferred on him, and said that he would do his best to ensure at least that the Society would not be in worse case the following year.

VOTE OF THANKS TO RETIRING PRESIDENT

Dr. H. A. THOMAS, in moving a cordial vote of thanks to the retiring President, Mr. G. E. Holden, said that it had been a privilege to serve under him on the Council. He had shown a keen interest in the Society's affairs, and although active in business and as Dyestuffs Controller he had attended every meeting of Council during his two years of office. His tact, patience, and tolerance put people at their ease. He said the right things at the right time, notably at the Harrogate Symposium Dinner. He had helped Council to arrive at satisfactory solutions to knotty problems by allowing freedom to all to express their thoughts, and then encouraging a compromise. Finally, Dr. Thomas hoped that Mr. Holden would continue to take an active interest in the Society, and wished him good luck for the future.

Mr. HAROLD FOSTER said it was a pleasure to second the vote of thanks, as Mr. Holden had been a benign spirit in Council, keeping in order both young and old members who were forthright in their views. He had conducted his office in a most charming, quiet manner.

The motion was carried with acclamation.

Mr. HOLDEN, in reply, said he had been flattered by the remarks of Dr. Thomas and Mr. Foster. He had enjoyed the work and loved the Society. His compliments were due to the officers and staff, and his thanks to all members.

ELECTION OF VICE-PRESIDENTS, ORDINARY MEMBERS OF COUNCIL, HONORARY TREASURER, AND HONORARY SECRETARY

The Honorary Secretary stated that a total of 589 ballot papers had been received, of which 16 had been rejected as spoilt, leaving 573 valid papers. The following had headed the poll—

VICE-PRESIDENTS—Mr. F. Farrington, Mr. F. L. Goodall, Mr. J. M. Goodall, and Mr. J. M. Preston.

The President then declared the above four members elected Vice-presidents of the Society.

ORDINARY MEMBERS OF COUNCIL—Professor W. Bradley, Dr. R. L. Elliott, Mr. A. Thomson, and Dr. T. Vickerstaff.

The President similarly declared these four members elected Ordinary Members of Council.

HONORARY TREASURER—Mr. H. Jennison unopposed.

HONORARY SECRETARY—Mr. J. Barritt unopposed.

The President declared these two members elected, and thanked them for their past services in these offices.

VOTE OF THANKS TO SCRUTINEERS

A cordial vote of thanks to the scrutineers was moved by Mr. J. BOULTON, seconded by Dr. T. A. FORSTER, and carried.

VOTE OF THANKS TO RETIRING COUNCIL MEMBERS

Mr. E. A. SWIFT, in moving a vote of thanks to retiring Council members (*viz.* *Vice-presidents*—Mr. H. Foster, Mr. D. B. F. McAndrew, Dr. H. A. Thomas, and Mr. G. M. Williams; *Ordinary Members of Council*—Mr. C. L. Bird, Dr. P. W. Cunliffe, and Mr. R. J. Hannay), expressed appreciation of the work and self-sacrifice involved in membership of the Council.

Mr. W. L. LANGTON seconded the motion, which was carried with acclamation.

ELECTION OF HONORARY SOLICITORS

Mr. G. M. WILLIAMS, in moving the re-election of Messrs. John Conchar & Co. as Honorary Solicitors to the Society, said that this was no mere courtesy title, and that Mr. R. Conchar had rendered able assistance and done an immense amount of work in connection with the negotiations for an agreement with the American Association of Textile Chemists and Colorists for the production of the second edition of the *Colour Index*.

Mr. H. TURNER seconded the motion, which was carried.

ELECTION OF HONORARY PATENT AGENT

Mr. F. M. STEVENSON, in moving the re-election of Mr. J. V. Armstrong as Honorary Patent Agent, said that Mr. Armstrong had always shown himself ready and willing to assist the Society when necessary.

Mr. J. PORTER seconded the motion, which was carried.

APPOINTMENT OF AUDITORS

On the motion of the Honorary Treasurer, seconded by Dr. R. L. ELLIOTT, Messrs. Rawlinson,

Greaves & Mitchell were reappointed Auditors to the Society.

AMENDMENT TO THE BYE-LAWS

The Honorary Secretary moved the following amendment, proposed by the Council—

In Bye-law 20 *The Immediate Past President* to be followed by *or President-elect*.

Mr. Barritt said that the purpose of this amendment was merely to ensure that the President-elect, the office of which had been created at the 1949

Annual General Meeting, was *ex-officio* a member of the Council.

Mr. A. S. FERN seconded the motion, which was carried unanimously.

VOTE OF THANKS TO CHAIRMEN

On the motion of Mr. F. L. GOODALL, seconded by Mr. N. HAMER, a cordial vote of thanks was accorded to the President and the Immediate Past President for their conducting the business of the meeting so ably and expeditiously.

Mr. HOLDEN expressed his own and Mr. Scholefield's appreciation of the vote of thanks.

Annual Dinner

The Annual Dinner of the Society was held at the Queens Hotel, Leeds, on Friday evening, 31st March 1950, under the presidency of Mr. Fred Scholefield.

The principal guest was Mr. W. Crossley (*Chairman of the Confederation of Textile Dyers and Finishers*). Among other guests were Mr. W. L. Andrews (*Editor of "The Yorkshire Post"*), Mr. J. Turner (*Prime Warden of the Worshipful Company of Dyers*), Dr. C. J. T. Cronshaw (*Renter Warden of the Worshipful Company of Dyers and Honorary Member of the Society*), Mr. R. Meldrum (*Master of the Worshipful Company of Feltmakers*), Mr. W. Kershaw (*Honorary Secretary of the Textile Institute*), Dr. L. H. Lampitt (*Past President and Foreign Secretary of the Society of Chemical Industry*), Mr. A. Hiles (*President of the Bradford Engineering Society*), Mr. P. Good (*Director of the British Standards Institution*), Mr. R. D. Fennelly (*Under Secretary, Board of Trade*), Mr. C. G. Hulse (*Secretary of the Dyestuffs Control, Board of Trade*), Professor W. Bradley (*Professor of Colour Chemistry and Dyeing in the University of Leeds*), Dr. D. W. Hill (*Deputy Director of the British Cotton Industry Research Association*), Dr. A. B. D. Cassie (*Director of Research of the Wool Industries Research Association*), Mr. J. Wilson (*Director of Research of the British Rayon Research Association*), Dr. D. A. Clibbens, Dr. S. M. Neale (*recipient of the Gold Medal of the Society*), Mr. H. à Brassard (*Chairman of the London Section*), Mr. R. D. Chorley, Mr. H. Boothroyd, Mr. G. Brearley, Mr. A. D. Ferns, Mr. F. L. Goodall, Mr. F. A. Helme, Dr. F. J. Siddle, Mr. F. R. Twemlow, and Mr. T. M. Wilcox.

The following officers of the Society were also present—Mr. G. E. Holden (*Immediate Past President*); Dr. C. M. Whittaker (*Past President*); Mr. J. G. Evans, Mr. J. M. Goodall, Mr. N. Hamer, and Mr. F. M. Stevenson (*Vice-presidents*); Mr. G. B. Angus, Mr. J. Boulton, Mr. C. O. Clark, Dr. R. L. Elliott, Dr. T. A. Forster, Mr. B. Kramrisch, Mr. W. Penn, Mr. F. Smith, and Mr. G. S. J. White (*Ordinary Members of Council*); Mr. F. Atack, Dr. R. H. W. Ellis, Mr. A. S. Fern, Mr. H. Foster, Mr. R. J. Hannay, Mr. J. H. Jackson, Mr. W. L. Langton, Mr. J. Porter, Mr. E. A. Swift, and Mr. H. Turner (*Ex-officio Members of Council*); Mr. J. V. Summersgill (*Honorary Secretary of the Publications Committee*); Mr. H. Jennison (*Honorary Treasurer*); and Mr. J. Barritt (*Honorary Secretary*).

"THE SOCIETY OF DYERS AND COLOURISTS"

After the toast of "His Majesty the King", that of "The Society of Dyers and Colourists" was proposed by—

Mr. W. CROSSLEY (*Chairman of the Confederation of Textile Dyers and Finishers*), who said that his sense of the privilege of proposing the toast of the Society coupled with the name of Mr. Scholefield was not untinged with trepidation, for he, unlike the President and many of the distinguished proposers of that toast on past occasions, was not a Yorkshireman. However, as a native of the county on the other side of the Pennines, he felt that the prolific migratory tendencies of Yorkshiremen to Lancashire reflected the greatest credit on their business acumen and foresight. Mr. Scholefield's election as President gave him personally great pleasure, and he felt it to be an honour worthily bestowed and thoroughly merited. Mr. Scholefield's devotion to, and experience in various branches of, the industry, his contributions to its development, and his facility for imparting his knowledge to many students over a number of years had forged a close bond between the industry and the Faculty of Technology of the University of Manchester. In spite of this, however, Mr. Scholefield's colleagues in Manchester would not grudge him an occasional visit to his native heath, in order to keep members in Yorkshire in touch with the latest developments in industry.

According to H. G. Wells, primitive man 20,000 years ago had used natural colouring matters, like woad, not only to stain the skins which he wore, but also to colour the one which he had obtained for nothing, so that the Society could not be given the entire credit for pioneering the art of dyeing. However, probably because the Society was *not* in being, progress was somewhat slow between 18,000 B.C. and A.D. 1856, when Sir W. H. Perkin (elected President in 1907) made the first synthetic dye. Since then, of course, development had been rapid, and while the dye users might perhaps deplore in some measure the resulting decline of craftsmanship in their section of the industry, they readily acknowledged that this was greatly outweighed by the enormous advantages bestowed on mankind by the synthetic dye industry. The range and variety of dyes now available was so wide that some poor dye users felt that they must make their selection by mathematical permutations no less

complex than those used by football pools enthusiasts.

Mr. Crossley felt that, as a mere business man, who pretended to know a little about everything, he did not need to dwell on the importance of colour in our life, but there was one aspect which had apparently never been given sufficient commercial recognition, namely the increase in value (not necessarily monetary) which the addition of colour gives to an article, out of all proportion to its cost. Thus in the case of a dyed shirt, costing not less than £2 2s. 0d. over the counter, the value of the dye rarely exceeded 3d., and the application of the dye, including bleaching, mercerising, and finishing, absorbed less than a further 6d. Any downward variation in these prices, even to zero, could have no possible influence on the selling price, so that in effect price competition in the dye industry could lead only to quality degradation, to the advantage of nobody at all. However, as some form of competition was essential to all industrial progress, he believed that in our industry competition should be on quality rather than on price. Minimum standards of performance capable of enforcement should be introduced, and business would then tend to go to producing units in proportion to their ability to rise above those minimum standards. The days when the various sections of an industry (commercial, technical, productive, administrative) could be divided into watertight compartments were past, and the impact of each on the others necessitated closer liaison, so that technology simply could not be divorced from economics.

The mistaken policy of price competition had in the main been avoided by dyemakers, partly because of their own good sense, and partly because of the limited number of firms operating in that field. Their refusal to cut each other's throats had resulted in neither exorbitant profits nor inefficiency; on the contrary, dyes had risen in price by less than 50% since 1938, less than most other commodities. The position of the dye users, at least of the textile section thereof, was not quite so satisfactory, though it was far better than before the war. Co-operation was far more difficult, as the users operated in much smaller and more numerous units, and production was not confined to a limited number of standardised articles. Most dyers operated on commission, and therefore could not influence overall demand. They were mostly individual specialists in a limited number of materials, though collectively they covered an enormous and diverse range. With no unit of production, a regulated economy had been achieved only with the greatest difficulty.

One after-effect of the price war of attrition of the 1930s was the shortage of skilled scientists, technicians, and works supervisors, the dearth of the supervisory or foreman type—the man on the floor who possesses perhaps only a part-time technical education—being probably the most serious of all. Even in the graduate class, in spite of the large number being turned out by universities and technical colleges, the shortage still gave rise to concern. Some of these men were entering

industries not allied to textiles, nor to colour, but even those who remained tended to drift to the larger organisations, research associations, and Government departments, because of their greater security. Although some magnificent developments had resulted from the sinking of enormous sums of money into speculative fields of research by these great organisations, there was a danger that this great work might be carried out at the expense of the unit of average size. The independence of the industry depended on a balance in technical progress between such units and the industrial colossi. This was a problem which might well engage the attention of the Society, the industry, and the university and college authorities, in the hope that those who followed might be made to realise that the acquisition of relative security was not necessarily the main objective of their life's work.

Although the Society had done magnificent work in disseminating knowledge of the science and art of dyeing and printing, producing a *Journal* beyond compare, and creating standards which must raise the performance of materials, there still remained much work for it to do. Apart from the number of missing links remaining to be filled in the various colour ranges, it was conceivable that new classes of dyes would be made available, possessing properties not yet envisaged. The Society should not merely act as a scientific and technical focal centre between dyemakers and dye users, but should take a greater interest in commercial and industrial problems. It might possibly help to introduce more colour harmony into the creation of the numerous fashion shade ranges produced by the different sections of the industry, apparently in complete independence. Its activities should be extended to include the semi-technical personnel of the industry, and it should develop some means of attracting and sustaining the interest of these productive floor supervisors, who, after all, were the backbone of the industry.

Mr. FRED SCHOLEFIELD (*President of the Society*), in responding to the toast, firstly thanked Mr. Crossley very sincerely for the grace and warmth of his toast to the Society, and for his generous personal references. He quoted some remarks of Dr. Johnson, recorded by Boswell, on the subject of public speaking: "We must not estimate a man's powers by his being able or not able to deliver his sentiments in public . . . because there may be other reasons for a man's not speaking in public than want of resolution—he may have nothing to say." Mr. Crossley had certainly provided him with something to say.

With regard to the rival counties, the Society had been born 66 years ago in Yorkshire, in "a suburb of Leeds called Bradford", and its seat of government had remained there ever since, the Society owing much to the loyal, continuous, and intensive work of members of the West Riding Section. He was particularly pleased that Mr. W. S. Stansfield, a fifty-year member, was able to be present that evening. The relations of the two counties had been well put in Lord Halifax's story of the man at a Bank Holiday Yorkshire *versus*

Lancashire cricket match, a native of neither county, who had been told by his neighbour to mind his own business when he had applauded the batsman frequently and loudly. Mr. Scholefield felt that the hatchet should be buried in a shallow and well marked grave.

At the inaugural meeting of the Society in May 1884, Sir Henry Roscoe, the famous Professor of Chemistry in Manchester, had given the principal address and had defined the purposes of the Society in the following words, which seemed just as true to-day—

It seems to me, Sir, that there are three ways in which a society like this can work, and in which it may be productive of good and useful results. In the first place I should put the advantages which a society of this kind gives for the improvement in technical knowledge of those engaged in the industry from which the Society takes its name. In the second place, another great advantage arises, namely, that of meeting and of bringing together those interested in the same pursuits in friendly converse, thus enabling them to know one another, and thus to improve the friendly and amicable relations which ought to exist always between the members of a great industry. A third direction in which the Society may prove itself useful is by bringing before the members the results of investigation and experiment on dyeing and cognate branches carried on elsewhere, and this can be accomplished by the publication of a journal as an organ of the Society.

It was thus clear that, from the very inception of the Society, technical education had in various ways been its *raison d'être*. Its *Journal* had, in the hands of a line of distinguished editors and most competent publications committees, become by common consent the most important medium of textile chemical technology in the world. The Society had always had the benefit and advice of the universities and technical colleges, and the names of Hummel, Knecht, Gardner, Green, Rowe, and many others were remembered with affection and gratitude.

In that inaugural address Professor Roscoe had spoken of the way in which Germany, Switzerland, Holland, Belgium, and other countries had surpassed England in providing facilities for technical education. Thus, sixty-six years ago the country had been faced with the problem of how to maintain its position in the world's markets in competition with other peoples, and to-day resort to improved training in technology was again one way of solving the same problem. The Society would be glad to co-operate in an attempt to raise the level of study and teaching of technology, and it had already considered the question of awarding its own diplomas to those who qualify as Tinctorial Technologists.

The question of the ideas about life and its values held by young men trained for the industry had been raised, and possibly some light might be shed on them by the young man who, having spent the fortune his father had made, explained that he had spent roughly a half on wine and women, and that he must have just wasted the rest. Seriously, the shortage of trained men would soon affect the ability of dyers and finishers to show maximum efficiency in quality and quantity. The case had been well stated by the chairman at a recent meeting of shareholders—

There is, perhaps, one disturbing feature in the industry which we suggest should be given more attention. There is a serious dearth of properly trained young men coming into the industry, in spite of the apparent improvement in prospects. No doubt the initial cause of the trouble goes back to the depressed era before the war, when the growing chemical industries, amongst others, quite naturally appealed more to the ambitious young man than the contracting textile trade. We are just about now beginning to feel the effects of this drift away from our industry, and in my view the position will worsen during the next few years, unless strong measures are taken by the trade to correct it. In this connection we must make closer contact with the textile college authorities, and offer improved training facilities in our factories. This important responsibility, upon which our future competitive ability in the world might depend, should not be left merely to the few firms who realise the danger signal ahead, and who, like your company, are trying to correct these tendencies.

The Society had been aware of the situation for some time, and had advocated the closer co-operation of educational authorities and the industries concerned.

This question of the training of scientists and technicians was no easy one. Granted that a knowledge of the basic sciences of mathematics, physics, and chemistry was necessary to the proper understanding of our industrial processes, and having regard to the great advances made in science during the past fifty years, it no longer seemed sensible to compress a course in technology at the university into three years. A minimum of four years would not be in advance of Continental and American practice. There was far too much examining and memorising and too little time to stand still and stare and think. As for the foremen, they could not be produced in technical colleges, but *better* foremen could be made there. One difficulty was that of organising part-time *day* courses, as it was not easy to do without the foreman in the works.

However, there was no need to be pessimists, always building dungeons in the air, and this was no Society of Criers and Dolourists. The Society could take pride in its share in bringing together Science and Industry, in a very fruitful marriage, and their progeny was seen in the remarkable series of new processes, fibres, dyes, and finishes which were creating a revolution. Much of the scientific work which had made this possible had been carried out in this country, and we should see to it that others did not snatch the financial reward because we were too slow in our technical application of science—"inertiative" had its disadvantages.

Coming to a matter which should be described in "money-syllables", almost alone among scientific and technical societies the membership subscription had not been raised, and if this should become necessary, he hoped that members would remain members, and would still pay as cheerfully as the man who pays cheerfully for his beer and 'bacey—

If I had now in cash instead of debts
The cost of last year's beer and cigarettes,
I'd spend it all on cigarettes and beer
To keep me happy for another year.

The right relations between the scientific and technical standards of the large and wealthy companies and those of the smaller firms could not be

regulated by a lowering of standards on either side. The latter could do much by co-operative effort, in research associations and otherwise.

Finally, with regard to some of the current activities of the Society, the second edition of the *Colour Index*, in course of preparation, would be a monumental work of the greatest value to all dye users and students of dye chemistry. It would involve the Society, in conjunction with the American Association of Textile Chemists and Colorists, in a huge capital expenditure, and would call for the highest skill in publicity and salesmanship. The work of the Society on fastness tests, carried out voluntarily and enthusiastically by a small number of members, was of importance to the British Standards Institution, and the Society was making efforts to establish standards and tests which would be accepted internationally. A Summer School was again being organised, to deal on this occasion with dyeing and to be held at Leeds University in September 1950.

PRESENTATION OF THE SOCIETY'S GOLD MEDAL
TO DR. S. M. NEALE

Dr. D. A. CLIBBENS, in presenting Dr. S. M. Neale, said that the number of direct cotton dyes, and their utilisation by the textile industry, had increased in almost bewildering manner during the few years following the appearance of the first representative in 1895. But the industry was to wait nearly half-a-century for any quantitative theory of the direct dyeing process. Real progress towards a successful theory of direct dyeing had started in about 1933, and had since been maintained at an accelerating rate. Several workers had contributed to this success, but if one were to be regarded as the leader, the choice would certainly be Dr. S. M. Neale.

In the course of his investigations at the Manchester College of Technology, Neale had built up a body of systematic and critical experimental data on the distribution of direct dyes between cellulose and the dyebaths in equilibrium with it. He had then introduced the inspired hypothesis that the direct dyeing process consists essentially in the formation of a complex anion. He had seen that such an ion, being a part of the molecular network of the fibre, would be non-diffusible, and should therefore be subject to the thermodynamic law known as the law of the Donnan membrane equilibrium. On this theoretical basis he had been able to correlate his experimental data—to construct the first quantitative theory of direct dyeing. In addition to these equilibrium studies, Neale's researches had included an investigation of the rate of direct dyeing. He had been one of the first to test experimentally the theory that the rate of dyeing is governed by the rate of a diffusion process subject to the classical law of diffusion.

Neale had achieved distinction, not only on account of his impressive personal contributions, but also—and that was scarcely less important—on account of the great influence he had exerted on the whole of contemporary research into the theory of the dyeing process.

Dr. S. M. NEALE, in reply, said that he was deeply gratified by the honour the Society had

bestowed upon him. Twenty years ago, it had been apparent that too many "theories of dyeing" flourished, because exact experimental facts were lacking. The process of dyeing is a complex one, but even a complex process can be dealt with in a simple and straightforward manner if one remembers to establish experimental conditions such that each factor can be isolated, and its effect studied separately. In the course of their work on dyeing it had become clear that it was not necessary to



SIDNEY MAURICE NEALE D.Sc

rely upon the specialised dogmas of colloid chemistry, but that the facts could be largely interpreted in terms of the classical physical chemistry of the nineteenth century.

He had been asked: "Why does the dye become fixed on the fibre?" The theoretical physicists could tell us exactly why two atoms of hydrogen combine to form one molecule, but very few of us could comprehend their answer properly. In attempting to comprehend the nature of the forces which join atoms and molecules together, we were straining the human intellect to its limits, but the "how" of these matters, which was the main concern of chemists, was more comprehensible than the "why". If he had in some small way helped to throw some little clear light on the "how" of the dyeing process, he was content. He would like to share the honour with all those who had joined him in the task, such as Mr. John Boulton, whom they were so glad to see there hale and hearty again, and to express his indebtedness to the President for his constant encouragement, and his appreciation of the privilege of being able to watch from close quarters

the development of Dr. Clibbens' own classical work on the modification of cellulose, an example from which he had gained very much.

"OUR GUESTS"

Mr. H. A. BRASSARD (*Chairman of the London Section of the Society*), in proposing the toast of "Our Guests", said that his long experience in the industry had trained him, he hoped also when speaking, to get level results, avoiding skitteriness and anything hasky. By avoiding soapiness he would escape rancidities and calcinaceous appendages. His tone should be neutral—neither too red, too yellow, nor too blue. And his finish should be delicate and as exclusive as possible; there should be no surface or interfacial tensions.

Mr. à Brassard explained to the guests that, within the Society, there was great friendship between dye-making and dye-using members. The President had already referred to Mr. Crossley. The Society was honoured by the presence of both the Prime Warden (Mr. Joseph Turner) and the Renter Warden (Dr. C. J. T. Cronshaw) of the Worshipful Company of Dyers, an ancient company who were immensely kind to the comparatively youthful Society; the former was the son of a pioneer of the industry, and the latter had been the Society's wartime President and was now an Honorary Member. It was a great pleasure to welcome Mr. R. D. Fennelly, Head of the Raw Materials Department at the Board of Trade, and also Mr. C. G. Hulse, Secretary of the Dyestuffs Control. The Society was further honoured by the presence of Mr. R. Meldrum, Master of the Worshipful Company of Feltmakers, who had offered a medal for presentation by the Society; papers on technical aspects of this industry would be welcomed in the *Journal*.

A very distinguished guest was Dr. L. H. Lampitt, a Past President and Foreign Secretary of the Society of Chemical Industry, who had taken an active part in international collaboration in chemical matters. The Textile Institute was represented by Mr. W. Kershaw, its Honorary Secretary, and here, again, cordial relations and close co-operation were maintained. The presence of Mr. A. Hiles, President of the Bradford Engineering Society, was a reminder of the importance of the engineer's assistance in our industry. It was a pleasure that Mr. P. Good was able to represent the British Standards Institution, with whom there was close collaboration on standards for fastness testing. The Society was fortunate in its relations with the research associations, which were well represented that evening—the British Cotton Industry Research Association by its Deputy Director, Dr. D. W. Hill, the British Rayon Research Association by its Director, Mr. J. Wilson, and the Wool Industries Research Association by its Director, Dr. A. B. D. Cassie—and the Society was particularly grateful to the last-named for the time which Mr. J. Barritt (Honorary Secretary) was able to devote to the Society's business.

Professor W. Bradley, of Leeds University, devoted much time to the Society, serving on the *Colour Index* Editorial Panel and on several other

committees; his staff, notably Mr. C. L. Bird as Chairman of the Publications Committee, also took an active part in the Society's affairs. The excellence of both the exterior and the interior of the *Journal* was due in no small measure to the care taken by the printers, and it was good that Mr. R. D. Chorley was able to be present that evening.

The attendance of representatives of the dye and chemical manufacturers was a reminder of the great help they rendered the Society, both by encouraging their staffs to take an active part in the Society's affairs and by advertising in the *Journal*.

Finally, Mr. à Brassard came to a very great man, Mr. W. L. Andrews, known to all both as Editor of *The Yorkshire Post* and as a broadcaster, who greatly honoured the Society by his presence. Mr. Andrews was a man of wide culture and learning, and occupied a whole column in *Who's Who*.

Mr. W. L. ANDREWS (Editor of *The Yorkshire Post*), in responding to the toast, said he was sure that all the guests were most grateful for the experience they had had that night, and none more so than himself. First of all, Mr. à Brassard had referred to him so generously as to be at the other extreme from the late Signor Mussolini, who had described him as "a whisky-sodden hyena of the British Press". Then it made one modest to feel that, while everyone else in that distinguished company was devoted to colour, his was a trade of mere black and white—especially when it came to controversy. After the brilliant speeches he had heard in praise of colour he was tempted to transform his paper and print the Conservative speeches in blue, the Socialist speeches in a range from pink to crimson, and the report of that dinner in letters of gold, while his own innocent and trustful comments might appear appropriately in green. He was impressed by the enthusiasm of members, and hoped that, with their colours nailed to the mast and flying in the breeze, they would sail under blue skies, with rose-coloured prospects and golden prosperity always around them.

He had been much impressed by the spirit of goodwill among dyers and colourists and their eagerness to work together in the Society. He had known industries in this country where each man wanted to keep his knowledge to himself and to work out his processes behind locks, bolts, and bars. Undue secretiveness was not the characteristic of a healthy industry, at any rate on this side of the Iron Curtain. Yorkshire manufacturers had told him how warmly they had been welcomed in the United States and Canada and how on their visits to works they had been invited to examine any process they liked. One friend of his had remarked at a Canadian factory: "But aren't you afraid that we shall get all your secrets and start to compete with you?" The Canadian had replied, smilingly: "You can copy these ideas if you like. By the time you've got them working on a competitive scale we shall be five years ahead of you. We're always making improvements."

Mr. Andrews went on to say that he knew there had been vast improvements in dyeing, and he

believed theirs was one of the industries in which science had yielded a most abundant harvest. He was sometimes a little nettled by Southerners who spoke of Yorkshire, Lancashire, and other industrial counties as if they were mere clusters of dark satanic mills, incomparably lower in cultural quality than the South. He wished that some of their critics could see our great factories and dye-works that produced so much of the wealth of the country and so much of the colour and resources that made life in the South so pleasant. The truth was that, but for the enterprise and skill of our Northern industries, a great many people in the South would never have been born. It was time to drop the exaggerated nonsense about dark satanic mills.

Dark satanic mills: that was a truly poetic expression, but he feared that not everyone remembered how William Blake had meant it when he had used it in his poem on Milton—

And did the Countenance Divine
Shine forth upon our clouded hills?
And was Jerusalem builded here
Among these dark Satanic mills?

That had been written almost 150 years ago by one who had lived in a dream world of symbolic figures that one might puzzle over for a lifetime. Mills to-day should be used as symbols not of dingy devilry but of industrial efficiency that were enriching our lives, creating a better Britain, and brightening our future. He wished the Society continued success in those aims.

COMMUNICATIONS

The Analysis of Commercial Hydrosulphites and Related Compounds by Polarographic Methods

W. FURNESS

The application of polarography to the analysis of hydrosulphites is discussed. The method outlined for the determination of hydrosulphite is shown to be more specific than some commonly used chemical methods, but the probable relative error is about 1%. Procedures for the polarographic determination of thiosulphate, sulphide, and trithionate in the presence of sodium hydrosulphite are also described, and the respective merits of the polarographic and chemical methods are compared.

Polarographic methods serve also for the identification of the formaldehyde- and the acetaldehyde-sulphoxylates.

Introduction

Sodium hydrosulphite can be produced commercially with a purity of 98% or more, but for various reasons the textile and dyeing industries prefer a standardised product containing, say, 90%. The remaining 10% may consist of sodium carbonate, chloride, sulphate, sulphite, metabisulphite, thiosulphate, or trithionate. It is quite common to encounter samples containing all these constituents, some of which may be added with the intention of stabilising the sodium hydrosulphite, others occurring unavoidably as by-products or decomposition products.

The chemical analysis of mixtures of this kind was attempted as long ago as 1905 by Binz and Sondag¹. Since then the literature dealing with the analytical chemistry of the hydrosulphites and related oxyacids of sulphur has become extensive, the more important contributions up to the year 1936 having been summarised by Kurtenacker².

Experience shows that some of the best chemical methods which have been proposed for the determination of hydrosulphite are not always sufficiently specific to serve for the evaluation of commercial samples. For this reason polarographic methods are being investigated (Brearley and Starkie³), and the results to be described will show that a degree of specificity superior to that of known chemical methods can be provided in several noteworthy instances. This is considered the foremost advantage to be realised by the application of polarography within this field. The precision attainable in the polarographic determination of hydrosulphite is seldom as good as in

volumetric processes, but when a probable relative error of about 1% can be tolerated in quantitative work the polarographic method is direct, and often more rapid and sensitive than other methods.

For example, the complete analysis of samples of partly decomposed hydrosulphites by chemical methods alone always presents difficulties. Determinations of the residual hydrosulphite content by several published procedures might well yield results which differ so much between themselves as to be of uncertain value. In such circumstances polarographic methods are especially appropriate, for besides providing a reliable determination of the residual hydrosulphite, they enable some of the decomposition products, e.g. thiosulphate, sulphide, trithionate, to be readily identified with certainty and estimated with an accuracy greater than that of known volumetric methods. In the foregoing applications the dropping mercury electrode is employed; its replacement by a platinum wire microelectrode extends the scope of polarographic methods, enabling the technically important salts of formaldehyde-sulphoxylic acid and acetaldehyde-sulphoxylic acid to be identified.

These examples, showing how polarographic methods may supplement chemical methods in technical analysis, will now be described in greater detail.

Analysis of Commercial Hydrosulphites

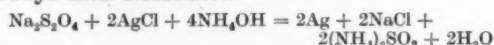
DETERMINATION OF HYDROSULPHITE CONTENT

The chemical methods most commonly used for the determination of hydrosulphite depend upon—

- (a) Reduction of Indigo Carmine (Brotherton & Co. Ltd.⁴)
- (b) Reduction of ammoniacal silver solution (Seyewetz and Bloch⁵, Smith⁶)
- (c) Formation of formaldehyde-sulphoxylate and titration of the latter with iodine (Merriman⁷).

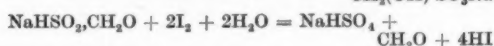
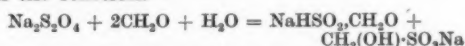
(a) For the first method it is difficult to prepare Indigo Carmine in a state of sufficient purity to serve as a primary standard, so that each new solution requires standardising against a sample of hydrosulphite analysed by some other method. When sulphide is present, as in samples of zinc hydrosulphite, the method yields inaccurate results.

(b) In the second method, the reaction between ammoniacal silver solutions and hydrosulphite has always been formulated—



In Smith's modification of the method due to Seyewetz and Bloch the precipitated silver is determined by the method of Volhard, but obviously if the sample contains sulphide the results will need appropriate correction. A more serious objection arises from the fact that the above equation does not accurately show the course of the reduction; in practice the stoichiometry is upset by the presence of traces of thiosulphate amongst the reaction products, and no adequate correction is possible.

(c) The third process, due to Merriman, is based upon the reactions—



and we have failed to detect any departure from the course formulated above. It is the most reliable volumetric method for the determination of hydrosulphite, and the results are vitiated only by the presence of thiosulphate and sulphide. Merriman supposed that thiosulphate was substantially absent, even in the case of badly decomposed samples of hydrosulphite, but recent work on samples from many different sources has established that sodium thiosulphate up to 1% often occurs in commercial sodium hydrosulphites, and occasionally as much as 3% may be present. It is worth while applying corrections for the presence of thiosulphate and sulphide in order to take advantage of the high precision of which Merriman's method is capable.

The polarographic method makes use of the fact that at a dropping mercury electrode processes of electro-oxidation or electro-reduction occur at potentials which are characteristic of the oxidisable or reducible ion. This is shown by the curve in Fig. 1. Thus, when sodium hydrosulphite is dissolved in an ammoniacal phosphate solution containing a trace of gelatin no reaction is observed at a dropping mercury electrode maintained at a potential of -0.8 v., this potential being referred to that of a saturated calomel electrode (S.C.E.) connected with the same solution. When the potential of the dropping electrode is gradually made more positive, $\text{S}_2\text{O}_4^{--}$ ions begin to discharge

at its surface, and a positive current flows from the dropping electrode through the ammonium phosphate solution towards the saturated calomel electrode. With increasing positive charge on the dropping mercury electrode the magnitude of this current increases, through a slight kink between -0.5 and -0.6 v., until a limiting value is reached at approx. -0.3 v. At this point, it is believed, every $\text{S}_2\text{O}_4^{--}$ ion which diffuses to the dropping mercury electrode is discharged there, from which it follows that the magnitude of the limiting current should be proportional to the maximum rate at which $\text{S}_2\text{O}_4^{--}$ ions can diffuse through the ammonium phosphate solution under the influence of the concentration gradient at the electrode. This process of electrolytic oxidation is simply represented by the equation—

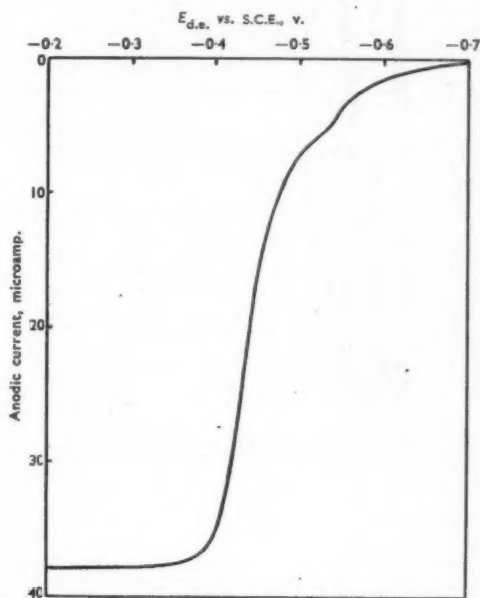
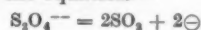


FIG. 1.—Current-Voltage Curve for 5.58×10^{-3} M. Sodium Hydrosulphite in 0.5 M. Diammonium Hydrogen Phosphate, 0.01% Gelatin. Temp. 25.0°C . $m^{1/2}t = 1.583 \text{ mg.}^{1/2} \text{ sec.}^{-1/2}$

The potential of the dropping mercury electrode at which the diffusion-controlled current has half its limiting value is known as the *half-wave potential*. Observation of the half-wave potential provides the most reliable polarographic evidence of the identity of the ion undergoing electrochemical change. Thus the polarogram of 0.015 M. hydrosulphite in a supporting electrolyte of 0.5 M. diammonium hydrogen phosphate, M. ammonium hydroxide, and 0.01% gelatin shows a half-wave potential of -0.43 v. versus S.C.E., and whether it be sodium hydrosulphite or zinc hydrosulphite in solution the same value is recorded.

Herein lies the specificity of the polarographic method. No other oxyacid of sulphur is known whose polarographic anodic wave has the same half-wave potential. The waves due to the aldehyde-sulphoxylates, thiosulphate, and sulphite

are anodic, but since they occur at much more positive potentials they cannot be mistaken for the hydrosulphite wave and can have no influence upon it even when present with the hydrosulphite in solution. The case of the sulphide ion is different, however, for in ammonium phosphate solution the ill-defined anodic wave due to sulphide is superimposed on the hydrosulphite wave, and it is impracticable to correct for its interference. Fortunately, such interference may be eliminated simply by the addition of zinc sulphate to the

recorded at maximum drop size (represented by OA on the ordinate) is directly proportional to the concentration of hydrosulphite.

The constant of proportionality is not wholly empirical. It can, in fact, be calculated by means of the Ilkovič equation⁶, but its determination by experiment is the more accurate. For example, using a capillary through which the rate of flow m of mercury is 1.36 mg./sec., the drop time t being 4.58 sec. (these constants giving for m^2t , as required by the Ilkovič equation, the value 1.583

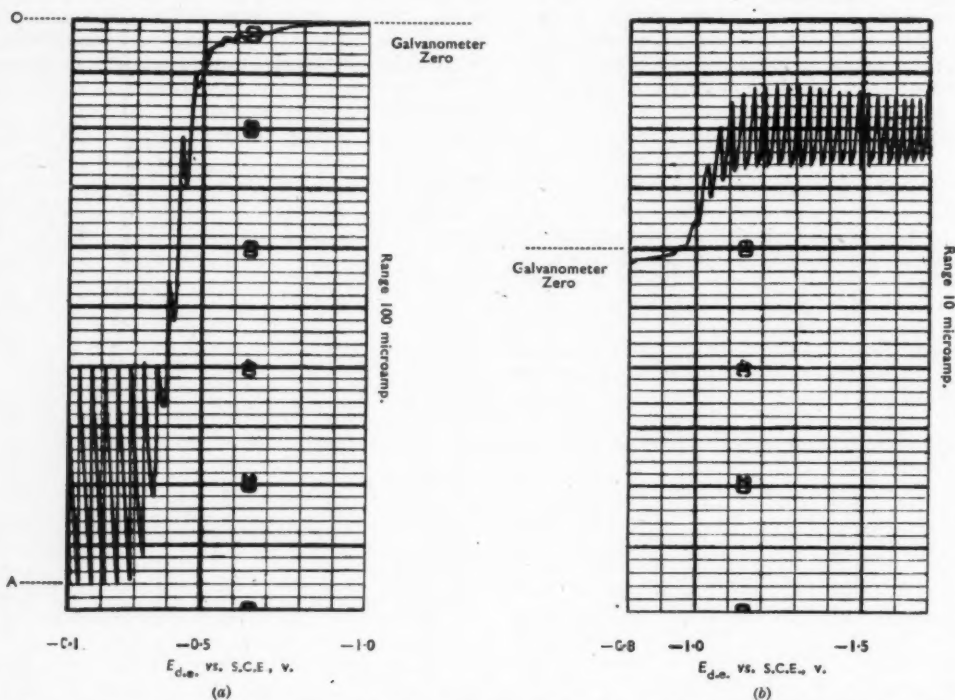


Fig. 2—(a) The Principal Anodic Wave and (b) the Subsidiary Cathodic Wave for 14.7×10^{-3} M. Sodium Hydrosulphite using 0.5 M. Diammonium Hydrogen Phosphate, M. Ammonium Hydroxide, 0.01% Gelatin, as Supporting Electrolyte. Temp. 25.0°C. $m^2t^{\frac{1}{2}} = 1.583 \text{ mg.}^{\frac{1}{2}} \text{ sec.}^{\frac{1}{2}}$

supporting electrolyte to precipitate the sulphide ion; and, of course, in the analysis of zinc hydrosulphite this precaution becomes unnecessary.

Data for the current-voltage curve in Fig. 1 could be obtained with a simple manually operated polarograph circuit, but in practice it is convenient to record the curve automatically. A suitable form of dropping mercury electrode and polarographic cell are described and illustrated at the end of this paper. Since the limiting current is governed by the maximum rate of diffusion of hydrosulphite ions to the surface of the dropping electrode, the growth and fall of mercury drops at the capillary impose a periodicity on the observed diffusion current. The increase in diffusion current during the latter part of the life of each drop can be traced out by means of the Tinsley pen-recording polarograph. The polarogram reproduced in Fig. 2(a) has been recorded in this way, and, although the movement of the pen is mechanically damped to a slight extent, the limiting value of the anodic current

(mg. $\frac{1}{2}$ sec. $^{-1}$), the constant at 25°C. is observed to be—

$$\frac{i_d}{C} = K_1 = 6.48 \text{ microamp. per millimole/litre} \\ (\mu\text{a.} \cdot \text{litre/millimole})$$

where i_d is the limiting (recorded) value of the anodic diffusion current at maximum drop size, and C is the concentration of hydrosulphite. This is the experimental basis on which the polarographic determination of hydrosulphite rests.

For solutions within the concentration range $1-15 \times 10^{-3}$ M. the probable relative error of the method is within 1% providing that sulphide is absent or its interference prevented by precipitation with zinc as aforementioned. The sensitivity of the method is such that sodium hydrosulphite may be determined with an accuracy of $\pm 5\%$ at a concentration of 25 mg./litre.

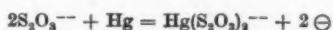
All commercial hydrosulphites which have been examined so far are further characterised by a second polarographic wave. When the polarogram

is extended to more negative potentials in the given ammoniacal phosphate supporting electrolyte a small cathodic wave is observed with half-wave potential -1.03 v. vs. S.C.E. This is shown in Fig. 2 (b). At a given temperature the ratio of the limiting cathodic current (b) to the limiting anodic current (a) is constant for all samples of hydrosulphites, and at 25°C . is equal to 0.029 . Experimental evidence so far available suggests that the cathodic wave is due to the reduction of a species of hydrosulphite ion whose concentration at 25°C . is much smaller than that of the simple $\text{S}_2\text{O}_4^{--}$ ion. An abnormally high temperature coefficient of $6\%/^{\circ}\text{C}$. for the limiting cathodic current is regarded as an indication of the effect of temperature on the hypothetical equilibrium between the two forms of hydrosulphite. This part of the work is receiving more detailed study.

It often happens that greater accuracy is required in a determination of hydrosulphite than can be attained by the direct polarographic method just described, and then the procedure of Merriman⁷ should be used with appropriate corrections if thiosulphate or soluble sulphide is present. It is often possible to determine both of these constituents polarographically when they occur in samples of sodium hydrosulphite or in partly decomposed hydrosulphite solutions.

DETERMINATION OF THIOSULPHATE IN PRESENCE OF HYDROSULPHITE

In a supporting electrolyte of potassium nitrate the thiosulphate ion gives a polarographic anodic wave. This wave was studied first by Revenda⁹, and later by Kolthoff and Miller¹⁰, who showed it to be due to the oxidation of mercury at the dropping electrode in accordance with the equation—

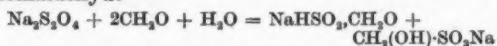


The anodic current i_d for maximum drop size at $+0.05$ v. vs. S.C.E. is directly proportional to the concentration C of thiosulphate, and the constant at 25°C . is observed to be—

$$\frac{i_d}{C} = K_2 = 3.55 \mu\text{a.} \cdot \text{litre/millimole}$$

when the rate of flow of mercury is 1.34 mg./sec. and the drop time 4.33 sec. By way of example the polarogram of 3.83×10^{-3} M. thiosulphate in 0.2 N. potassium nitrate is illustrated in Fig. 3.

The half-wave potential of the thiosulphate wave occurs close to -0.14 v. vs. S.C.E., so that its polarogram cannot be recorded with adequate sensitivity in the presence of a relatively large concentration of hydrosulphite. The analysis of hydrosulphites for traces of thiosulphate is, however, rendered possible after reaction with formaldehyde—



because the anodic wave of the formaldehyde-sulphoxylate ion occurs at still more positive potentials, whilst the formaldehyde-bisulphite ion does not appear to react at all at the dropping mercury electrode. Metabisulphite and sulphite, which may also be present in the sample, are at the

same time converted to formaldehyde-bisulphite. Under the conditions of the experiment thiosulphate ion does not react with formaldehyde.

A 3-g. sample of the hydrosulphite is dissolved in a slight excess of aqueous formaldehyde (5 ml. of a 36% wt./vol. solution) and 25 ml. of air-free water. After allowing 10 min. for the above reaction, the solution is neutralised with dilute nitric acid using phenolphthalein as indicator. As supporting electrolyte 20 ml. of N. potassium nitrate is added, and after dilution to 100 ml. a polarogram of the solution is recorded between $+0.15$ and -0.3 v. vs. S.C.E.

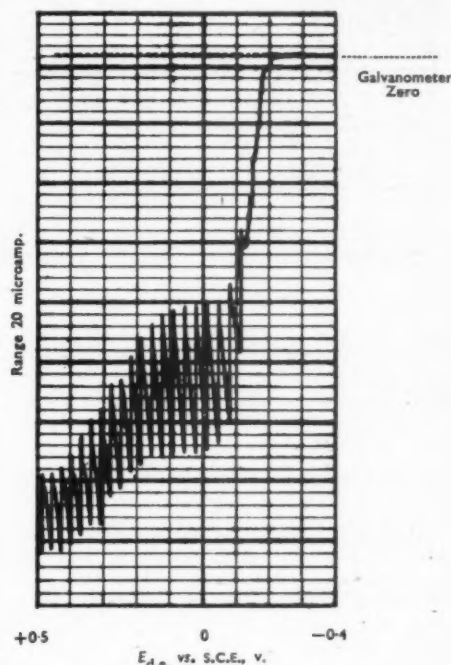


FIG. 3—Polarogram of 3.83×10^{-3} M. Thiosulphate in 0.2 N. Potassium Nitrate.
Temp. 25.0°C . $m^{1/2} = 1.547$ mg.^{1/2} sec.^{-1/2}

In the absence of soluble chloride the polarographic procedure permits the determination of 0.1% of sodium thiosulphate; when the content of sodium thiosulphate is of the order of 1% , the probable error does not exceed 0.02% . In speed, accuracy, and sensitivity the polarographic procedure is then superior to the known chemical methods.

However, if the sample contains chloride the anodic wave due to the chloride ion (whose half-wave potential is close to $+0.25$ v. vs. S.C.E.) may coalesce with that due to thiosulphate, in which case a quantitative polarographic analysis becomes impossible. When the percentage of sodium chloride in the sample does not exceed that of thiosulphate the two waves can be satisfactorily resolved. Fig. 4 illustrates the analysis of a sample containing 3.10% of sodium thiosulphate and 1.58% of sodium chloride.

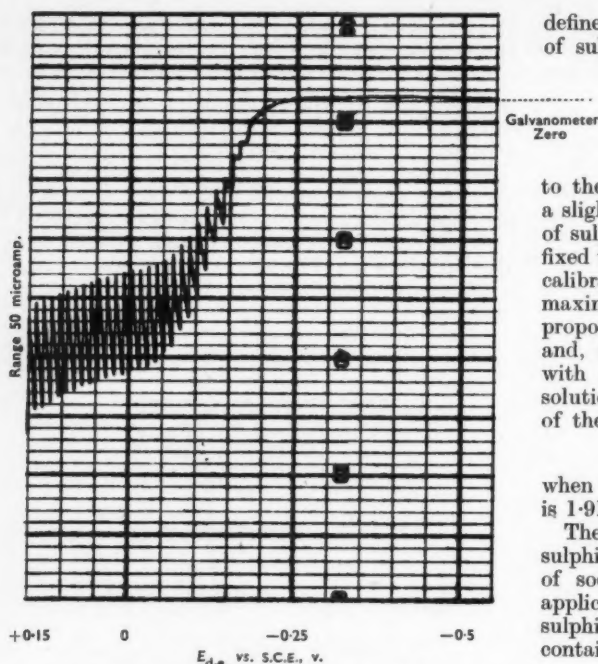


FIG. 4—Polarogram of a Neutral Solution of 3.00 g. of Sodium Hydrosulphite Sample in 100 ml. of 0.2 N. Potassium Nitrate, containing Formaldehyde to eliminate Anodic Wave of Hydrosulphite. The anodic wave beginning at -0.25 v. is due to the presence of 3.10% sodium thiosulphate in the sample, which also contained 1.58% sodium chloride.

Temp. 25.0°C . $m^{1/2}t^{1/2} = 1.823 \text{ mg.}^{1/2} \text{ sec.}^{-1/2}$

DETERMINATION OF SULPHIDE IN PRESENCE OF HYDROSULPHITE

Although sodium sulphide seldom occurs in commercial sodium hydrosulphite, the sulphide or hydrosulphide ion is produced in small quantity by decomposition of neutral or faintly acidic solutions of hydrosulphite. Sulphide is also formed in the decomposition of strongly alkaline hydrosulphite solutions³, especially when thiosulphate is also present¹. For its determination in solutions of this kind no direct chemical procedure is available, and even if the sulphide is first separated by precipitation further decomposition may occur while the precipitate is being collected. There is need here for a rapid method that can be completed with the minimum of chemical dosing.

Revenda⁹ and Kolthoff and Miller¹⁰ noted that at the dropping mercury electrode sulphide ion in a supporting electrolyte of 0.1 N. sodium hydroxide gave a well defined anodic current proportional to the concentration of sulphide ion. They reported a half-wave potential of approx. -0.6 v. vs. S.C.E. for 0.001 M. sulphide solution.

For a given concentration of sulphide the anodic wave in a supporting electrolyte of diammonium hydrogen phosphate is relatively much smaller than in 0.1 N. sodium hydroxide, and the wave form is quite unsuited for quantitative analysis. This is probably due to the formation of incompletely dissociated ammonium sulphides. In a supporting electrolyte of disodium hydrogen phosphate, however, the anodic wave is again well

defined, and can be used for the determination of sulphide in commercial sodium hydrosulphite or in partly decomposed hydrosulphite solutions from which ammonium salts are absent. The anodic wave of hydrosulphite must, of course, be eliminated, and formaldehyde is therefore added to the supporting electrolyte. Formaldehyde has a slight suppressive effect on the diffusion current of sulphide ion, so that its concentration must be fixed when preparing the standard polarograms for calibration purposes. The anodic current i_d for maximum drop size at -0.35 v. vs. S.C.E. is proportional to the concentration of sulphide ion, and, using 0.1 M. disodium hydrogen phosphate with 5% aqueous formaldehyde (36% wt./vol. solution) as the supporting electrolyte, the value of the constant at 25°C . is given by—

$$\frac{i_d}{C} = K_s = 7.75 \mu\text{a.} \cdot \text{litre/millimole}$$

when the rate of flow of mercury from the capillary is 1.91 mg./sec. and the drop time 3.42 sec.

The method permits the determination of sodium sulphide in the presence of a thousandfold excess of sodium hydrosulphite, but, of course, it is applicable only in the absence of metals whose sulphides are insoluble. A polarogram of a solution containing sulphide is illustrated in Fig. 5.

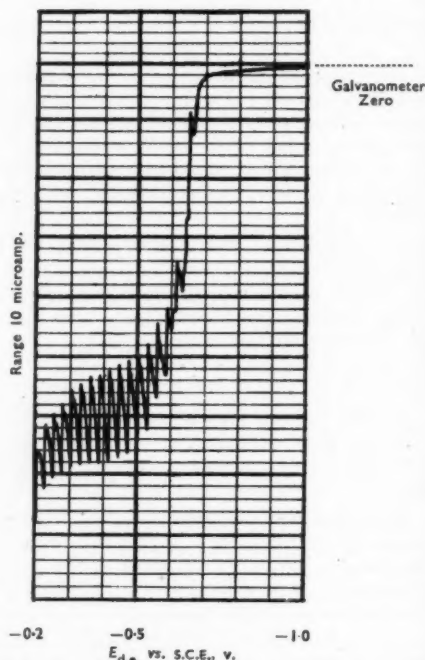


FIG. 5—Polarogram of 0.87×10^{-3} M. Sodium Sulphide in 0.1 M. Disodium Hydrogen Phosphate, containing Formaldehyde to eliminate Anodic Wave of Hydrosulphite.

Temp. 25.0°C . $m^{1/2}t^{1/2} = 1.85 \text{ mg.}^{1/2} \text{ sec.}^{-1/2}$

DETERMINATION OF TRITHIONATE IN PRESENCE OF HYDROSULPHITE

It has already been noted, using a supporting electrolyte of 0.5 M. diammonium hydrogen phosphate and M. ammonium hydroxide with 0.01%

gelatin, that the polarogram of hydrosulphite is composed of a principal anodic wave and a subsidiary cathodic wave. In the polarographic examination of many old, or partly oxidised, samples of sodium hydrosulphite in the same supporting electrolyte a further small cathodic wave may be observed. The half-wave potential of this wave is approx. -1.4 v. *vs.* S.C.E., and its magnitude remains unchanged after an interval of 24 hr., although a considerable proportion of the hydrosulphite in solution may by then have become oxidised through exposure to the atmosphere. The possibility of this cathodic wave being due to the electroreduction of water (the so called "water wave" of Orlemann and Kolthoff¹¹) has been examined and rejected. The wave does, in fact, exhibit all the properties of the cathodic wave of the trithionate ion, and, although it has not been possible to obtain confirmatory results by chemical methods, it is reasonable to infer from the polarographic data that sodium trithionate may occur as a decomposition product of sodium hydrosulphite in amounts up to at least 3%. The cathodic waves of the hydrosulphite and trithionate ions are illustrated in Fig. 6.

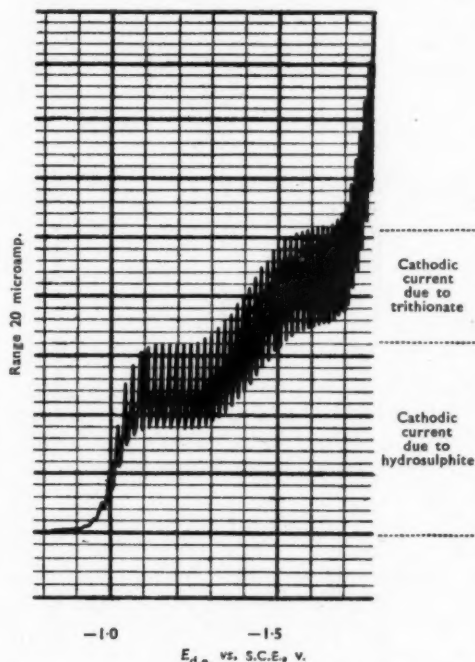


FIG. 6—Cathodic Waves of Hydrosulphite and Trithionate. 1.00 g. sodium hydrosulphite and 0.0140 g. sodium trithionate in 100 ml. of 0.5 M. diammonium hydrogen phosphate, M. ammonium hydroxide, 0.01% gelatin.

Temp. 25.0°C. $m^2/t^{\frac{1}{2}} = 1.77 \text{ mg.}^{\frac{1}{2}} \text{ sec.}^{-\frac{1}{2}}$

The diffusion current i_d of the trithionate ion at maximum drop size is measured by the height of the step between -1.2 and -1.65 v. *vs.* S.C.E. It is found to be directly proportional to the concentration, and the value of the constant is given by the expression—

A5

$$\frac{i_d}{C} = K_4 = 0.8 \mu\text{A.} \cdot \text{litre/millimole}$$

when the rate of flow of mercury from the capillary is 1.96 mg./sec. and the drop time at -1.6 v. is 2.1 sec.

Analysis of Commercial Aldehyde-sulphoxylates

IDENTIFICATION OF THE FORMALDEHYDE- AND ACETALDEHYDE-SULPHOXYLATES

Perhaps the most interesting application of polarography in the analysis of aldehyde-sulphoxylates is the identification of the aldehydic component. Sodium formaldehyde-sulphoxylate is the most widely used of the aldehyde-sulphoxylates, and the technical grade usually contains 90–95% of the dihydrate $\text{CH}_2\text{O} \cdot \text{NaHSO}_2 \cdot 2\text{H}_2\text{O}$ together with several per cent. each of sodium formaldehyde-bisulphite and free sodium sulphite. The normal and the basic zinc formaldehyde-sulphoxylates are also well known. Of the sulphoxylates derived from other aldehydes and ketones, only sodium acetaldehyde-sulphoxylate is of technical importance at the present time.

The formaldehyde- and acetaldehyde-sulphoxylates enter into oxidation reactions at the dropping mercury electrode at potentials which are positive when measured against that of the saturated calomel electrode. For example, the anodic wave due to the formaldehyde-sulphoxylate anion begins at approx. $+0.15$ v. *vs.* S.C.E., but, even in a potassium nitrate supporting electrolyte, it is not possible to trace the course of this wave very far in the direction of more positive potentials, before the rapid anodic dissolution of mercury begins to produce an anodic current so large as to render quite impossible the observation of the diffusion current due to the formaldehyde-sulphoxylate anion.

In such circumstances the dropping mercury electrode may, with advantage, be replaced by a bright platinum wire microelectrode. This electrode may even be brought to a potential of $+1.1$ v. *vs.* S.C.E. in aqueous solutions of inert supporting electrolytes before liberation of oxygen begins. It is, however, a disadvantage of the stationary platinum microelectrode that, whenever a process of electrolytic oxidation is proceeding at its surface, the applied e.m.f. must be changed only very gradually and, for each new value of its potential, several minutes must be allowed to elapse before a stable state of polarisation is attained.

Using the platinum electrode in this way, in conjunction with a manually operated polarograph, the anodic waves due to the electrolytic oxidation of the formaldehyde-sulphoxylate and acetaldehyde-sulphoxylate ions may be traced. A supporting electrolyte consisting of 0.05 M. sodium citrate and 0.05 M. citric acid is suitable for the sodium or zinc aldehyde-sulphoxylates. From Fig. 7 and 8 the following characteristic values for the half-wave potentials are derived—

Formaldehyde-sulphoxylate	...	$+0.25$ v. <i>vs.</i> S.C.E.
Acetaldehyde-sulphoxylate	...	$+0.64$ v. <i>vs.</i> S.C.E.

Although the polarograms reproduced in Fig. 7 and 8 were all obtained with the same platinum

Potential of Stationary Platinum Microelectrode vs. S.C.E., v.

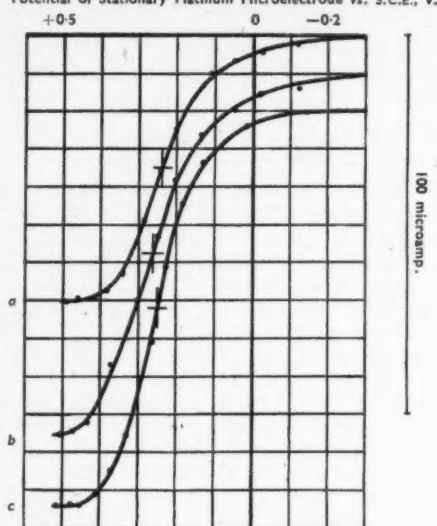


FIG. 7—Manual Polarograms of Sodium Formaldehyde-sulphoxylate (a) 0.0152 M., (b) 0.0166 M., (c) 0.0182 M., in 0.05 M. Sodium Citrate, 0.05 M. Citric Acid, at 25.0°C., using a Stationary Platinum Micro-electrode

Potential of Stationary Platinum Microelectrode vs. S.C.E., v.

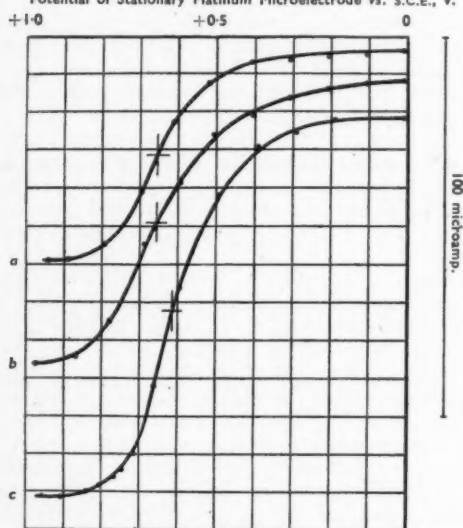


FIG. 8—Manual Polarograms of Sodium Acetaldehyde-sulphoxylate (a) 0.0082 M., (b) 0.0103 M., (c) 0.0166 M., in 0.05 M. Sodium Citrate, 0.05 M. Citric Acid, at 25.0°C., using a Stationary Platinum Micro-electrode

microelectrode, the limiting values of the diffusion currents are not strictly proportional to the concentrations of the aldehyde-sulphoxylates, and this procedure is not a satisfactory means of quantitative analysis. Nevertheless, for the half-wave potentials the mean deviations are only 0.01 v. and 0.02 v. for the formaldehyde- and acetaldehyde-sulphoxylates respectively, and for the purpose of qualitative analysis the method has the advantage of being applicable to a few millilitres of solution whose concentration need not exceed 0.01 M.

Apparatus

A Tinsley pen-recording polarograph was used throughout this work, and a dropping mercury electrode and polarograph cell were constructed to meet particular requirements.

A suitable dropping electrode is shown in Fig. 9. A rubber stopper, to which the capillary *M* is

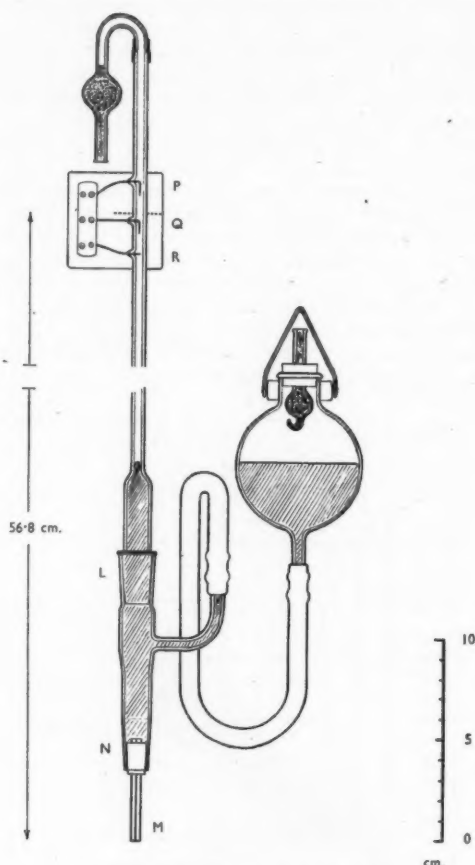


FIG. 9—Dropping Mercury Electrode Assembly

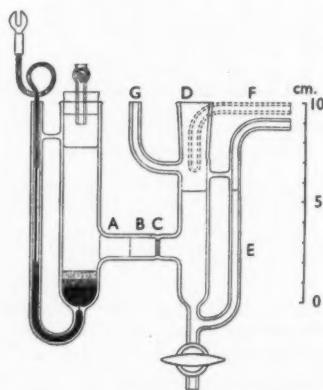


FIG. 10—Polarographic Cell with permanently attached Saturated Calomel Electrode

attached, is inserted through the joint *L* and pushed home into the standard taper joint *N*. When the mercury is raised to the level of the dotted line electrical connection is made at *Q*. By means of the connections *P, Q, R* it is possible to measure the rate of flow of mercury from the capillary using an electric clock in the manner described by Lingane¹².

The form of polarograph cell shown in Fig. 10 is a development of the familiar *H* type devised by Lingane and Laitinen¹³. The left-hand compartment consists of a saturated calomel electrode, joined to the right-hand side by a bridge containing gels of agar-saturated potassium chloride solution *A* and agar-saturated potassium nitrate solution *B*. The latter is adjacent to the sintered glass disc *C*. The right-hand compartment holds the solution under examination, and is connected to the dropping electrode by insertion of the standard taper *N* in the standard ground joint *D*. This form of cell may also be used with the stationary platinum microelectrode.

Dissolved oxygen is removed from the solution by admitting pure nitrogen through the long side tube *E*. During electrolysis nitrogen passes through *F* over the surface of the solution, and escapes through the small side tube *G*, which may be fitted with a Bunsen valve if the contents of the cell demand rigorous protection from atmospheric oxidation, as, for example, with hydrosulphite solutions.

It is a pleasure to acknowledge the advice and encouragement of my Research Manager, Dr. W. Cule Davies, throughout the course of this work and in the preparation of this paper. Thanks are also due to the Directors of Messrs. Brotherton & Co. Ltd. for permission to publish this report.

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Some Observations on the Tendering of Nylon by Exposure to Light

O. NEWSOME

In experiments on the effect of certain black dyes on the tendering of nylon by exposure to light, none of the dyes increased the degree of tendering, while several decreased it, logwood and Multamine Black B (ICI) being particularly effective. Experiments on the action of chromium compounds suggested that the protective action of logwood is mainly due to the presence of chromium.

Introduction

The property of increasing or decreasing the photochemical degradation of textile fibres, which is possessed by many dyes, has received a good deal of attention in both its theoretical and practical aspects, and Egerton¹⁻³ has recently studied the photochemical degradation of nylon. He has examined the effects of a range of Dispersol, Duranol, Solacet, S.R.A., and vat dyes, and some basic dyes, and has elaborated a theory of the mechanism of photochemical degradation involving the formation of activated oxygen and hydrogen peroxide.

The primary purpose of the present work was the purely practical and somewhat restricted one of comparing dyes of various types which are used for the production of blacks on nylon, in their effects on the tendering which occurs on exposure to light. For this purpose, loss in mechanical breaking strength was considered a satisfactory measure of the degree of degradation.

Preliminary experiments indicated that logwood increased the resistance of nylon to light considerably, and the work was extended to determine whether this was due to some specific property of

the dye or impurities in the dye, or whether a similar degree of resistance resulted from the presence of chromium compounds only.

Hadfield and Sharing⁴ have stated that excess dichromate is difficult to remove from nylon dyed by the afterchrome method, and that the reduction of the residual dichromate which occurs on exposure to light is accompanied by increased degradation. As the method usually recommended for dyeing logwood on nylon is an afterchrome process, the effects of residual dichromate in the dyed nylon have been examined. A chrome mordant method is also recommended by Tisdale⁵, and this has been compared with the afterchrome method.

It was not possible to make the exposures under conditions of controlled humidity, but Egerton¹ has shown that the effect of varying humidity on the photochemical degradation of nylon is not usually large, and it is not considered that the validity of the results is seriously affected by this factor.

Discussion of the theoretical aspects of the subject is beyond the scope of this paper, but it is considered that the practical implications of the

results obtained are of sufficient importance to justify their publication.

It may be pointed out that the dyes used were selected simply as representatives of their various classes, and it is to be presumed that equivalent products of other manufacturers will have similar properties.

Experimental

MATERIAL—A 2-fold 70d/23 filament English nylon yarn with 14 t.p.in. 8 singles twist and 14 t.p.in. Z doubling twist, and containing 0.33% of titanium dioxide, was used.

The yarn was scoured for 20 min. at 90°C. in a solution containing 4 c.c. Teepol (Shell) and 1 c.c. ammonia (sp. gr. 0.880) per litre, and thoroughly rinsed.

DYEING METHODS—Dyeings were made in 25-vol. baths, using the methods recommended by the respective dye manufacturers. The percentages used were those required to give full blacks on the nylon described above. Full details of the dyeing methods are given in the Appendix.

EXPOSURE—Specimens were wound on cards with a space of approx. 1 mm. between the threads, and were exposed to sunlight under glass, facing South at an angle of 45° to the vertical. The fading of the S.D.C. light-fastness standards⁶ was used as an indication of the severity of the exposure.

Dyeings 1–11 were exposed in Spanish Town, Jamaica, during March and April 1949—

(a) for 166 hr. daylight (including 95.5 hr. sunlight)

(b) for 248 hr. daylight (including 150.75 hr. sunlight).

These exposures were sufficient to produce strong fades on standards 5 and 6 respectively.

The remaining specimens were exposed in Jamaica during August and September 1949 until standard 5 was faded to the same extent as before. This required exposure for 352 hr. daylight, including 196.5 hr. recorded sunlight.

Some specimens were also exposed at the University of Leeds from 7th July 1949 to 22nd August 1949.

TENSILE STRENGTH TESTS—The tensile strength of each specimen before and after exposure was determined by means of the Goodbrand single-thread tester. Twenty-five tests were made on each specimen, using 17.5-cm. test lengths.

The first series of tests were made under the standard conditions of 70°F. and 65% R.H. Subsequent tests were made in an uncontrolled atmosphere, and the results were corrected to the standard conditions by means of the correction factors of Loasby and Puls⁷.

I—A COMPARISON OF VARIOUS BLACK DYES

A series of dyeings of representative members of various classes of dye were exposed in Jamaica during March and April 1949, for periods required to produce marked fades on S.D.C. light-fastness standards No. 5 and 6. A number of the same dyeings were also exposed in Leeds during July and August and again in Jamaica during August and September 1949, exposure being continued

until No. 5 standard was faded to the same extent as before. The reduction in tensile strength, calculated as a percentage of the strength of the corresponding unexposed specimen, is given in Table I.

TABLE I
Loss in Tensile Strength (%) of Nylon Yarns on Exposure to Light

	(a)	(b)	(c)	(d)
(a) in Jamaica for 166 hr. (March–April 1949)				
(b) in Jamaica for 248 hr. (March–April 1949)				
(c) in Jamaica for 352 hr. (Aug.–Sept. 1949)				
(d) in Leeds for 46 days (July–Aug. 1949)				
Scoured undyed nylon	56	69	70	49
1 12% Multamine Black B (ICI)	9	29	22	20
2 12% Dispersol Diazo Black BS (ICI)	54	65	—	—
3 6% Serisol Diazo Black B200 (YDC)	54	68	—	—
4 2.5% Dispersol Diazo Black 2BS (ICI)	47	62	57	47
5 9 g. Hematine Crystals NAD (WICW) per litre, afterchromed	19	27	28	18
6 8 g. Hematine NAD + 1 g. Fustic Crystals per litre, afterchromed	20	29	—	—
7 20% Hematine Crystals C (WICW), on chrome mordant	14	31	—	11
8 17.5% Hematine C + 2.5% Fustic Crystals, on chrome mordant	13	29	—	—
9 6.6% Coomassie Fast Black B150 (ICI)	32	46	40	36
10 6.6% Solochrome Black WDFa 150 (ICI), afterchromed	16	24	—	—
11 6.6% Solochrome Black WDFa 150 (ICI), method of Hadfield and Sharing ⁴	25	35	35	30

It appears from these results that dyeing with logwood confers a high degree of resistance to light on nylon, and that logwood is superior in this respect to the other dyes examined, with the possible exceptions of Multamine Black B and Solochrome Black WDFa. It is interesting to note that Solochrome Black WDFa dyed by the method of Hadfield and Sharing⁴ (afterchroming with dichromate, followed by reduction with sodium thiosulphate), which is now the recommended method, tendered to an appreciably greater extent than when dyed by the ordinary afterchrome method. The chrome mordant method gave a somewhat better result with logwood than the afterchrome method.

Taking into account the fact that the exposures were made under very different conditions, the results obtained with the different series of exposures show fairly good agreement, except in the case of Multamine Black B. This, however, is known to be a mixture of dyes and might well be expected to show anomalous behaviour under varying conditions of exposure. It is evident that the use of S.D.C. light-fastness standards is not a satisfactory method of assessing the severity of exposure for tendering purposes, since (a), (c) and (d) were all exposed until the No. 5 standards had faded to the same extent, but the degrees of tendering produced differ appreciably.

II—THE ACTION OF HEAT ON NYLON

Possibly the most striking feature of the results in Table I is the rapid tendering of the undyed nylon, particularly when exposed in Jamaica. Thermometers placed between two layers of (a) undyed nylon and (b) black nylon, exposed in Jamaica under the same conditions as the test specimens, registered maximum temperatures of 54°C. and 62°C. respectively, and it was thought that these relatively high temperatures might be

partly responsible for the high degree of degradation produced. Undyed nylon was therefore wrapped on a card in the same way as the specimens for exposure, and suspended in an oven heated to 60-65°C. for 100 hr. Heating was carried out intermittently over a period of several weeks and the nylon was then tested, a loss in tensile strength of approx. 1% being found. While it thus appears that nylon is almost completely resistant to thermal degradation at the temperature concerned, the possibility that the rate of photochemical degradation may be influenced by temperature is not entirely ruled out.

III—THE EFFECTS OF CHROMIUM COMPOUNDS ON NYLON

Experiments were made to determine whether the protective action of a logwood black could be obtained by treating the nylon with chromium compounds alone, and whether the slight inferiority of a logwood black dyed by the afterchrome method, compared with one dyed by the chrome mordant method, could be ascribed to the presence of residual dichromate.

Skeins of nylon yarn were treated with potassium dichromate and acetic acid in 25-vol. baths for 30 min. at 95°C., and rinsed in hot water. The effects of soaping at 60°C. and 85°C. and of reduction with sodium thiosulphate or sodium bisulphite on the dichromate-treated nylon and on nylon dyed with logwood were tried. Soaping was carried out for 15 min. with 2 g. soap per litre, and treatment with reducing agents for 15 min. at 80°C. was followed by soaping at 60°C. Soaping the dichromate-treated nylon at 60°C. did not remove the yellow colour of the dichromate completely; soaping at 85°C. appeared to remove the dichromate completely, but chromium could just be detected by the lead acetate test when the fibre was ashed and fused with potassium chlorate. Details of the treatments used and of the results of tensile strength tests on the exposed yarns are given in Table II.

TABLE II
Loss in Tensile Strength (%) on Exposure to Light of Nylon Yarns

(a) treated with dichromate (b) dyed with logwood		
Undyed nylon	...	70
(a) 4 g. $K_2Cr_2O_7$ + 2 c.c. ACETIC ACID (80%) PER LITRE—		
14 Soaped at 60°C.	...	20
15 Soaped at 85°C.	...	30
16 Reduced, 10% $Na_2S_2O_3$ + 5% acetic acid (80%)	...	32
17 Reduced, 5% $NaHSO_3$ + 2.5% acetic acid (80%)	...	27
(b) DYED 9 g. HEMATINE NAD PER LITRE, AFTERCHROMED 4 g. $K_2Cr_2O_7$ + 2 c.c. ACETIC ACID (80%) PER LITRE—		
18 Soaped at 60°C.	...	31
19 Soaped at 85°C.	...	26
20 Reduced, 5% $NaHSO_3$ + 2.5% acetic acid (80%)	...	29

The results indicate that treatment of undyed nylon with dichromate followed by soaping does not increase the rate of tendering on exposure, but actually has a marked protective action, which persists even when the amount of chromium remaining on the fibre is small. There is no apparent advantage in reducing the dichromate to the tervalent form. This suggests that the presence of residual dichromate on dyed nylon should not be harmful, but the results obtained

with the logwood-dyed samples appear to lead to the opposite conclusion. While there is apparently a slight advantage in removing excess dichromate as completely as possible after dyeing, the amounts remaining on the fibre after soaping are unlikely to be sufficiently large to be of practical significance for most purposes. Reduction of the excess dichromate to the tervalent state appears to be less effective than its removal from the fibre by severe soaping.

The results obtained lead to the conclusion that the protective action of logwood on nylon is mainly due to the presence of chromium, and while the dye itself may have some influence, this is probably not large in comparison with that of the chromium.

IV—VARIATION IN CONCENTRATION OF DICHROMATE

Previous dyeings of logwood by the afterchrome method had been made with a concentration of 4 g. potassium dichromate per litre (10% on the weight of nylon), while only 1% dichromate was used in chrome mordanting. In order to determine whether the stability to light is affected by the concentration of dichromate used, dyeings of Hematine Crystals NAD afterchromed with 2 g. and 4 g. respectively of potassium dichromate and 2 c.c. acetic acid (80%) per litre, and of Hematine Crystals C on a mordant of 1% potassium dichromate and 3% formic acid (85%), were exposed to light. The results of tensile strength tests are shown in Table III.

TABLE III
Loss in Tensile Strength (%) on Exposure to Light of Logwood Blacks on Nylon

Undyed nylon	...	70
19 9 g. Hematine NAD—4 g. $K_2Cr_2O_7$ per litre	...	26
32 9 g. Hematine NAD—2 g. $K_2Cr_2O_7$ per litre	...	22
28 25% Hematine C on chrome mordant	...	18

It appears that reducing the concentration of the chrome bath in dyeing by the afterchrome method reduces the degree of tendering slightly, and that the difference between the afterchrome and chrome mordant methods may probably be accounted for by the difference in the amounts of chromium present. The results given in Tables II and III suggest that there is an optimum concentration of chromium on the fibre which will give the maximum resistance to light. This is likely to be only of theoretical interest, however, as 1.75-2.0 g. potassium dichromate per litre has been found to be the lowest concentration which will give complete fixation of the dye under the conditions of these experiments. It may also be observed that, although the chrome mordant method apparently gives greater resistance to photochemical degradation, it gives dyeings which are of inferior fastness to light and wet treatments compared with the afterchrome method.

V—IMPURITIES IN HEMATINE CRYSTALS

The impurities in Hematine Crystals consist partly of tannins, and as tannic acid treatments have been used to protect silk against the action of light, it appeared possible that tannins contribute to the protective action of logwood on nylon.

Skeins of nylon yarn were treated with (a) 2.5% and (b) 5% tannic acid for 30 min. at 95°C. and rinsed. A skein was also dyed with 3 g. pure haematoxylin per litre, afterchromed with 4 g. potassium dichromate per litre, and soaped at 85°C. These dyeings and a similar dyeing of Hematine Crystals NAD were exposed to light, the results of tensile strength tests being given in Table IV.

TABLE IV
Effect of Logwood, Haematoxylin, and Tannic Acid on the Loss in Strength (%) of Nylon on Exposure

	Undyed nylon	...	...	...	...	70
13	3 g. Haematoxylin per litre, afterchromed...	...	...	...	...	27
19	9 g. Hematine NAD per litre, afterchromed	...	...	...	...	26
21	2.5% Tannic acid	...	...	...	...	52
22	5.0% Tannic acid	...	...	...	...	48

Tannic acid is thus seen to have a slight protective action on nylon, but, since pure haematoxylin is as effective as commercial Hematine Crystals, it may be concluded that tannins play no part in the protective action of logwood on nylon.

Conclusions

Of the dyes examined all except the diazotised and developed blacks decrease the tendering of nylon on exposure, logwood being the most effective, with the possible exception of Multamine Black B (ICI), which, however, appears to be considerably affected by variations in the conditions of exposure.

The protective action of logwood is mainly, but possibly not entirely, due to the presence of chromium.

It is advisable when dyeing logwood on nylon to use the lowest concentration of dichromate which will give a fully developed black, and to remove the excess as completely as possible, but the quantity of excess dichromate remaining after soaping is not considered to be seriously harmful.

Treatment of undyed nylon with dichromate followed by soaping produces a marked increase in resistance to light, even when the quantity of chromium remaining on the fibre is very small.

The author wishes to thank Mr. E. Slattery of the Manchester College of Technology for advice and facilities for making the tensile strength tests,

and the directors of the British Dyewood Co. Ltd. and the West Indies Chemical Works Ltd. for permission to publish this paper.

APPENDIX

Dyeing Methods

All the dyeings except Multamine Black B were soaped for 15 min. at 60°C. with 2 g. soap per litre.

MULTAMINE, DISPERSOL DIAZO, AND SERISOL DIAZO BLACKS—Dyed for 1 hr. at 85°C. with 2 c.c. Teopol per litre. Diazotised and developed—3 g. sodium nitrite and 8.75 c.c. hydrochloric acid (sp. gr. 1.16) per litre for 30 min. at 60°C.; 5% 2:3-hydroxynaphthoic acid and 5% acetic acid (30%), 35°C. to 60°C. in 30 min., 30 min. at 60°C.

LOGWOOD—(a) *Afterchrome*—Dyed with Hematine NAD and 0.5 c.c. acetic acid (80%) per litre, 40°C. to 95°C. in 20 min., 45 min. at 95°C. Washed and afterchromed with 4 g. potassium dichromate and 2 c.c. acetic acid (80%) per litre, 55°C. to 95°C. in 20 min., 30 min. at 95°C.

(b) *Chrome Mordant*—Nylon mordanted with 1% potassium dichromate and 3% formic acid (85%), 40°C. to 95°C. in 30 min., 1 hr. at 95°C. Washed and dyed with Hematine Crystals C for 1 hr. at 95°C.

COOMASSIE FAST BLACK B—Dyed with addition of 2% acetic acid (80%), 70°C. to 95°C. in 15 min., 1 hr. at 95°C. 1% Formic acid (85%) added, and dyed for a further 30 min.

SOLOCHROME BLACK W DFA—(a) Dyed as Coomassie Fast Black B above. Afterchromed in fresh bath with 5% potassium dichromate and 2% acetic acid (80%) for 1½ hr. at 95°C.

(b) *Revised Method (Hadfield and Shering)*—Dyeing started cold with 3% acetic acid (30%), raised to 95°C. in 20 min., and dyed for 10 min.; then 3% formic acid (85%) added, and dyeing continued for 50 min. Afterchromed in fresh bath with 2% potassium dichromate and 3% formic acid (85%) for 1 hr. at 95°C.; then 10% sodium thio-sulphate added, and chroming continued for a further 30 min. at 95°C.

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The Distribution of Direct Dyes between Wool and Cotton in One-bath Union Dyeing

Part I—Durazol Red 2B

C. L. BIRD, C. M. NANAVATI, and C. B. STEVENS

Durazol Red 2B shows maximum affinity for cotton at 40°C., but is absorbed more rapidly at higher temperatures; on wool both the rate of absorption and the amount of dye absorbed increase as the temperature is raised. The effects of adding Glauber's salt to the dyebath, and of varying the liquor-goods ratio, are very similar for both wool and cotton. Addition of small amounts of acid to the dyebath greatly increases the amount of dye absorbed by the wool, but the absorption by cotton is relatively insensitive to pH changes. Provided that acid is not present, the percentage exhaustion of a union dyebath is low, except when the amount of dye available is small.

When only a small amount of dye is used, the colour of the two fibres is the same when each contains the same amount of dye. As the percentage of dye on the fibre increases more dye is required on the cotton than on the wool if the shades on the two fibres are to match. Ultimately, the amount of dye required on the cotton may be four times as much as that required on the wool. The maximum depth of shade obtainable on cotton is much less than that obtainable on wool.

INTRODUCTION

As far as the authors are aware, no previous quantitative study has been made of the absorption of a direct dye by wool and cotton present in the same dyebath. This state of affairs is not surprising. Clearly, a study of the dyeing properties of the individual fibres must precede the study of mixtures of fibres.

As a result of the work of Neale¹, in particular, the behaviour of cotton towards direct dyes is now well understood. Some of the factors involved have been discussed at some length². The position as regards wool is less clear, because direct cotton dyes are not used to any great extent on this fibre, except in union dyeing. Further, most of the work on wool dyeing has been carried out in an acid dyebath, but the work of Goodall³ with the neutral-dyeing Polar Yellow R Conc. (Gy) is of interest in this connexion. The behaviour of direct dyes towards cotton and wool, as known from laboratory experiments and practical experience, may be summarised as follows—

Direct dyes vary very greatly in the rate at which they are absorbed by cotton and other cellulosic fibres. Thus, Boulton⁴ has recorded values ranging from 0.07 min. to 260 min. for the time of half-dyeing of direct dyes on viscose rayon. The effect of raising the temperature of the dyebath is to increase the rate of absorption, but to diminish the amount of dye absorbed at equilibrium². In practice, however, when the time of dyeing is relatively short, e.g. 1 hr., maximum absorption of dye may occur at a high temperature, e.g. 100°C., if a slow-dyeing direct dye is used. Pure direct dyes are absorbed to a very small extent, if at all, in the absence of common salt or Glauber's salt. The amount of dye absorbed increases steadily as more salt is added to the dyebath. Great differences are observed between individual direct dyes in their sensitivity to salt, some dyes requiring a much larger addition of salt to the dyebath than others. It is generally accepted that common salt and Glauber's salt have the same effect in the dyebath, provided that chemically equivalent quantities are used. The main effect of increasing the liquor-goods ratio is to decrease the concentration of added salt, so the amount of dye absorbed is reduced. The amount of direct dye absorbed by cotton is not

greatly affected by the pH of the dyebath¹, except when the free acid of the dye has a low solubility.

Less information is available with regard to the absorption of direct dyes by wool. In general, direct cotton dyes resemble neutral-dyeing acid dyes, which, as a class, show considerable aggregation in solution at low temperatures, the particle size being too great to allow them to penetrate wool readily below about 70°C.³ Maximum absorption of dye takes place at the boil. The rate of dyeing is fairly low in a neutral dyebath, but the maximum amount of dye absorbed at equilibrium is considerably greater than that absorbed by cotton. Addition of Glauber's salt to a neutral dyebath is known to increase the amount of dye absorbed in most cases. Direct cotton dyes, in general, behave like neutral-dyeing acid dyes as far as the effect of pH is concerned, a small decrease in the pH of the dyebath, especially below pH 7, resulting in a very greatly increased absorption of dye by the wool.

The above facts accord with practical experience of single-bath union dyeing, in which temperature is the governing factor. With those direct dyes which dye both wool and cotton from a neutral bath, it is found that at temperatures near the boil the wool dyes more deeply than the cotton, whereas at low temperatures the dye does not penetrate the wool readily and the cotton dyes more deeply than the wool. Care is taken to prevent the bath from becoming acid, as this would result in greatly increased absorption of dye by the wool.

Choice of dyes is very important in single-bath union dyeing, and the direct cotton dyes may be divided into two classes according to whether (a) they dye the cotton and wool to approximately the same depth of shade, or (b) dye the cotton more deeply than the wool. Townend and Simpson⁵ have shown that this division is largely governed by the degree of sulphonation of the dye, monosulphonates appearing in class (a) and tetrasulphonates in class (b).

The result obtained is also influenced by some other factors. Thus, any chemical or physical modification of the wool or cotton is likely to affect the result. Acid chlorination, for example, results in more ready absorption of direct dyes by wool. Another factor is the relative diameters of the

fibres. Fothergill⁶ has shown, in the case of viscose rayon, that for optical reasons coarser fibres require less dye than finer fibres to give the same depth of shade. A similar effect is to be expected with fibres of different kinds such as wool and cotton, in which case the wool will require less dye than the cotton for the same depth of shade.

The percentage of dye is likely to influence the result in union dyeing only when low percentages of dye are accompanied by a high degree of exhaustion of the dyebath. In these circumstances there will be competition between the two fibres, and the fibre with higher affinity is likely to absorb dye at the expense of the other fibre. Such a state of affairs can be anticipated at temperatures near the boil, when the wool is likely to absorb most of the direct dye, provided that it belongs to class (a). The effect of varying the percentage of dye will be seen most clearly with dyes which exhaust well.

The result will also be affected by the proportions of wool and cotton in the union material. Thus, if the wool dyes more deeply than the cotton, any increase in the proportion of wool in the material will result in the production of a darker shade⁷. A further complication occurs with direct dyes which do not exhibit the same hue on the two fibres.

OUTLINE OF THE INVESTIGATION

It was decided to dye wool and cotton with purified direct dyes under controlled conditions so that the effect of the following factors could be investigated—

- (a) Time
- (b) Temperature
- (c) pH
- (d) Concentration of sodium sulphate or chloride
- (e) Liquor-goods ratio
- (f) Variation in the percentage of dye
- (g) Variation in the wool-cotton ratio.

The same wool and cotton materials were used throughout, so the effect of variation in the fibres was not examined. Apart from one series (g), 1.5% purified dye on the weight of material was used throughout.

In order to separate the effects of these factors on the distribution of dye between the wool and cotton, the work was divided into three sections, viz. dyeings on—

- (i) Wool only
- (ii) Cotton only
- (iii) Equal weights of wool and cotton.

Each section consisted of a series of dyeings at different temperatures with one variable factor, e.g. time, percentage of Glauber's salt, or pH, followed by determination of dye in the residual bath and on the fibre. In addition, a series of dyeings of increasing depth was prepared on wool and cotton, respectively. The quantity of dye on the fibre was then correlated with the depth of shade expressed in Lovibond Tintometer units.

In the classification adopted by the Society², the direct cotton dyes are divided into three classes from the point of view of the dyeing of cellulosic

fibres, viz. (A) self-levelling, (B) salt-controllable, and (C) temperature-controllable. Direct dyes of all three types are used in one-bath union dyeing, so it was decided to examine one dye from each class, the dyes chosen being—

Class A	...	Durazol Red 2B (Colour Index No. 278)
Class B	...	Chlorazol Sky Blue FF (Colour Index No. 518)
Class C	...	Chlorazol Brown M (Colour Index No. 420)

So far, only one of these dyes has been examined, viz. Durazol Red 2B, formerly known as Chlorazol Fast Red K.

DURAZOL RED 2B—The time of half-dyeing of this dye, as determined by Boulton⁴, is 0.74 min. It is therefore a rapid-dyeing dye. Lenher and Smith⁸ have shown that Durazol Red 2B is aggregated in solution at low temperatures (25–50°C.) but tends to disaggregate as the temperature is raised, reaching a constant aggregation number in the neighbourhood of 70°C. The range of aggregation numbers, i.e. the number of molecules of dye in the aggregate, was found to lie between 28 at 25°C. and 5 at 94°C. Durazol Red 2B is largely used in the dyeing of wool-cotton union materials, being recommended (a) for solid shades on the two fibres obtained by dyeing at 40–95°C. for 45 min. followed by 30 min. at 95°C., and (b) for filling in the cotton without dyeing the wool at 40°C. approx. When dyed for 1 hr., it is known to exhibit maximum absorption on cotton at 60°C. approx., and in the manufacturers' pattern cards it is listed 5 as regards levelling, i.e. it migrates very readily. This ease of migration, probably arising from the low degree of exhaustion of the dyebath, results in poor fastness to wet treatments.

EXPERIMENTAL

The wool used in this work was in the form of commercially scoured wool flannel from 66–68s merino wool. It was purified by extraction in a Soxhlet, first with ether and then with alcohol, after which it was washed well with distilled water and dried. The purified wool was stored in a humidity room at 22°C. and 65% R.H., and the weights of wool given subsequently refer to the conditioned material. The cotton used was in the form of bleached unmercerised sateen having a cuprammonium fluidity of 2.7. It was stored in a humidity room, as in the case of the wool.

Commercial Durazol Red 2B was purified by the method of Robinson and Mills⁹ and then kept in the humidity room, where it acquired a moisture content of 12.2%. The purity of the dry dye was determined by reduction with titanous sulphate and found to be 98.2%. Commercial Durazol Red 2B 150, after drying, was found to contain 62.4% of the pure dye.

All other chemicals were of AnalaR quality, and distilled water was used throughout.

Dyeings were carried out in small conical Pyrex flasks, either immersed in a thermostatically controlled water-bath with stirring at regular short intervals or at the boil. Distilled water was added at intervals to make up for the water lost by evaporation. The degree of exhaustion of the dyebath was estimated using a Hilger Spekker photoelectric absorptiometer and Ilford blue-green filters No. 603.

When both wool and cotton were dyed in the same bath, the figures obtained by estimating the concentration of the residual dye liquor gave only the total absorption. It was thought that, by extracting the dye from the cotton, the absorption of the dye by the wool could then be obtained by difference. However, it was found that, when only small amounts of dye were present on the wool, the error was very large, so it was decided to extract the dye from both fibres. The dye was readily removed from the cotton with cold 20% aqueous pyridine, but extraction at the boil was necessary with the wool, and this resulted in some decomposition of dye, for which correction has been made. After extraction from the fibres the dye was diluted with 20% aqueous pyridine and estimated colorimetrically, in this case using a solution of the dye of known strength in 20% aqueous pyridine as the standard.

Except where otherwise stated, the experiments described below were carried out with 1.5% purified Durazol Red 2B and 20% Glauber's salt for 1 hr. in 40 vol., at 60°, 80°, and 100°C. in the case of wool, and at 40°, 60°, 80°, and 100°C. in the case of cotton and mixtures of wool and cotton. Percentages are based on the conditioned weight of material, viz. (i) 2 g. wool, (ii) 2 g. cotton, or (iii) 2 g. wool plus 2 g. cotton.

DYEINGS ON WOOL

EFFECT OF TIME—The results obtained by dyeing for different times are illustrated by Fig. 1, which shows that Durazol Red 2B is not completely absorbed from a dyebath containing 20% Glauber's salt. Equilibrium appears to be reached in 2 hr. at 100°C., but not at lower temperatures.

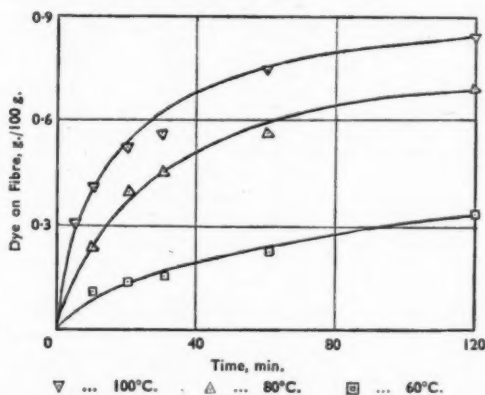


Fig. 1—Absorption of Durazol Red 2B by Wool

EFFECT OF GLAUBER'S SALT—The results obtained with varying amounts of Glauber's salt are illustrated by Fig. 2, which shows that very little Durazol Red 2B is absorbed by wool from a neutral bath in absence of Glauber's salt. The amount of dye absorbed increases steadily as increasing amounts of Glauber's salt are added to the dyebath.

EFFECT OF PH—Dyeings were carried out with varying additions of acid or alkali, but no Glauber's salt. The amounts of dye absorbed, together with

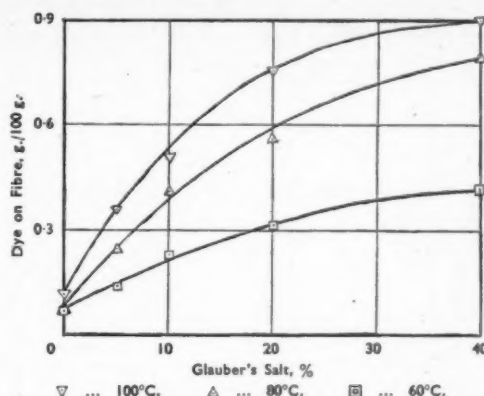


Fig. 2—Absorption of Durazol Red 2B by Wool in presence of Varying Amounts of Glauber's Salt

the pH values of the residual dyebaths, are given in Table I, illustrated by Fig. 3.

TABLE I
Effect of pH on Absorption of Durazol Red 2B by Wool

Addition	pH of Residual Dyebath	Absorption (g./100 g.)	Exhaustion (%)
40°C.			
0.5% Sodium carbonate ...	8.54	0.06	3.8
None ...	6.92	0.06	3.7
0.5% Acetic acid (30%) ...	6.77	0.08	5.5
1.0% ...	6.24	0.16	10.4
1.5% ...	5.46	0.31	20.8
2.0% ...	4.96	0.36	24.1
5.0% ...	4.32	0.48	32.2
60°C.			
0.5% Sodium carbonate ...	8.60	0.08	5.1
None ...	7.10	0.10	6.6
0.5% Acetic acid (30%) ...	6.86	0.09	5.9
1.0% ...	6.66	0.34	22.4
1.5% ...	5.96	0.99	65.7
2.0% ...	5.46	1.30	86.7
5.0% ...	4.60	1.47	97.9
80°C.			
0.5% Sodium carbonate ...	8.45	0.08	5.4
None ...	6.98	0.13	8.8
0.5% Acetic acid (30%) ...	6.78	0.23	18.6
1.0% ...	6.37	0.76	50.7
1.5% ...	6.06	1.23	85.2
2.0% ...	5.66	1.36	91.1
5.0% ...	4.55	1.50	100.0
100°C.			
0.5% Sodium carbonate ...	8.24	0.11	7.0
None ...	7.20	0.14	9.5
0.5% Acetic acid (30%) ...	6.77	0.32	21.5
1.0% ...	6.22	0.99	65.9
1.5% ...	5.85	1.36	91.5
2.0% ...	5.22	1.48	99.0
5.0% ...	4.38	1.50	100.0

It is seen that, at constant temperature and in the absence of Glauber's salt or other salt, the amount of Durazol Red 2B absorbed by wool is almost constant between pH 7 and pH 9. Only a small amount of dye is absorbed under these conditions, but when acetic acid is added to the dyebath the absorption increases very rapidly with increasing amounts of acid at 60°, 80°, and 100°C. At 40° the increase is less rapid, but is still considerable. The dyeings obtained at 60° at the lower pH values were "skittery", owing to superficial absorption of dye.

DYEINGS ON COTTON

EFFECT OF TIME—The results obtained by dyeing for different times are illustrated by Fig. 4. Under the conditions of the experiment the maximum exhaustion of Durazol Red 2B in 1 hr. was only 35%. As the temperature is raised the amount of dye absorbed at equilibrium decreases—the

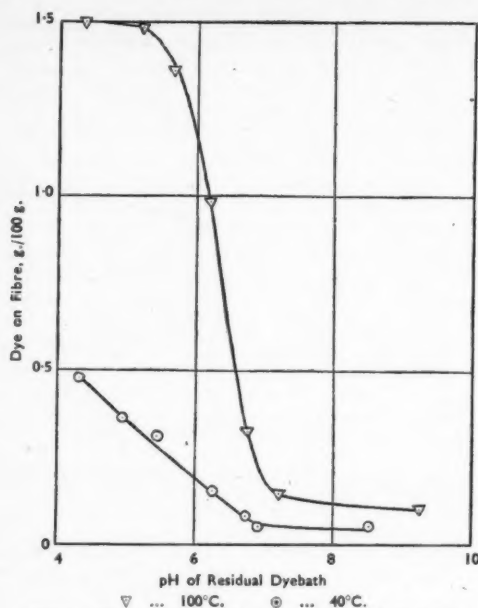


Fig. 3—Effect of pH on Absorption of Durazol Red 2B by Wool

40° and 60°C. curves cross after 1 hr.— but the rate of dyeing is much greater at the higher temperatures, equilibrium being almost reached in 10 min. at 100°C.

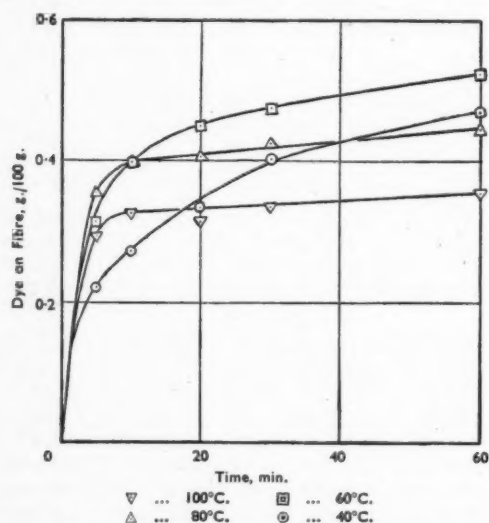


Fig. 4—Absorption of Durazol Red 2B by Cotton

EFFECT OF GLAUBER'S SALT—The results obtained in presence of different amounts of Glauber's salt are illustrated by Fig. 5, which shows that cotton absorbs comparatively little Durazol Red 2B in the absence of Glauber's salt. The amount of dye absorbed increases steadily with increasing addition of Glauber's salt, but even with 40% Glauber's salt the maximum exhaustion of the dyebath is only 47.2%.

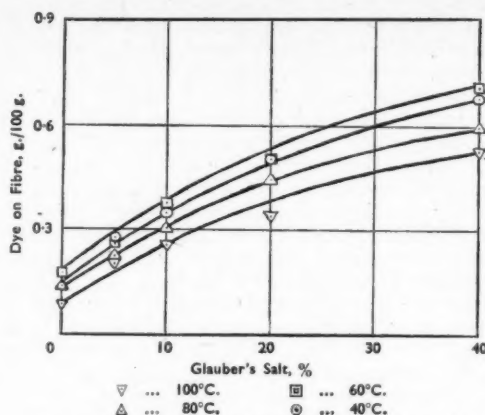


Fig. 5—Absorption of Durazol Red 2B by Cotton in presence of Varying Amounts of Glauber's Salt

EFFECT OF pH—Dyeings were carried out at 40° and 100°C. with varying additions of acid, both with and without 20% Glauber's salt. The results obtained are given in Table II. It is seen that, when cotton is dyed with Durazol Red 2B at different pH values, there is only a relatively small increase in the absorption of dye at 40° and 100°C. as the pH changes from 6.5 to 3.5.

TABLE II
Effect of pH on Absorption of Durazol Red 2B by Cotton

Acetic Acid (30%) pH of Residual Dyebath (%)	Absorption (g./100 g.)	Exhaustion (%)
40°C. (WITHOUT GLAUBER'S SALT)		
0	0.14	9.5
0.5	0.17	11.2
1.0	0.18	11.9
1.5	0.18	12.1
2.0	0.19	12.6
5.0	0.19	13.0
40°C. (WITH 20% GLAUBER'S SALT)		
0	0.50	33.4
0.5	0.47	31.4
1.0	0.51	33.9
1.5	0.52	34.5
2.0	0.55	36.3
5.0	0.61	40.9
100°C. (WITHOUT GLAUBER'S SALT)		
0	0.09	5.8
0.5	0.09	6.0
1.0	0.09	5.9
1.5	0.09	5.8
2.0	0.09	6.2
5.0	0.09	6.0
100°C. (WITH 20% GLAUBER'S SALT)		
0	0.33	22.1
0.5	0.39	25.9
1.0	0.34	22.5
1.5	0.35	23.2
2.0	0.33	22.3
5.0	0.36	24.1

DYEINGS ON MIXTURES OF WOOL AND COTTON

EFFECT OF TIME—The results obtained by dyeing for different times are given in Table III, illustrated by Fig. 6. When wool and cotton are dyed together under the conditions of the experiments, the total amount of Durazol Red 2B absorbed increases steadily with increasing time at all four temperatures. At 40°C. more dye is absorbed by the cotton than by the wool, but the position is reversed at the higher temperatures. Equilibrium is quickly reached with cotton at 80° and 100°C., but not with wool. There is no evidence

of dye boiling off the cotton on to the wool, presumably because of the considerable excess of dye present in all cases.

TABLE III
Effect of Time on Absorption of Durazol Red 2B by Wool and Cotton

	Time (min.)	Absorption (g./100 g.)		Exhaustion (%)
		Wool	Cotton	
40°C.	10	0.03	0.25	13.0
	20	0.04	0.31	14.0
	30	0.05	0.36	17.3
	60	0.07	0.45	20.1
	120	0.10	0.53	25.2
60°C.	10	0.14	0.33	17.3
	20	0.21	0.42	21.0
	30	0.22	0.44	24.3
	60	0.29	0.48	28.4
	120	0.48	0.48	31.9
80°C.	10	0.33	0.38	25.3
	20	0.45	0.39	28.2
	30	0.51	0.38	28.7
	60	0.71	0.38	35.2
	120	0.80	0.40	40.7
100°C.	10	0.59	0.34	30.6
	20	0.69	0.33	33.3
	30	0.73	0.33	34.2
	60	0.83	0.32	39.9
	120	0.99	0.33	44.7

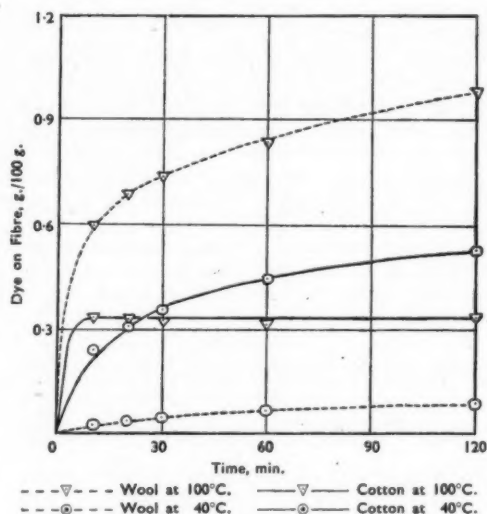


FIG. 6—Absorption of Durazol Red 2B by Wool and Cotton

EFFECT OF GLAUBER'S SALT—The results obtained in presence of different amounts of Glauber's salt are given in Table IV. It is seen that the amount of dye absorbed by both fibres increases steadily as increasing amounts of Glauber's salt are added to the dyebath.

EFFECT OF COMMON SALT—It was decided to examine the effect of replacing Glauber's salt by a chemically equivalent amount of common salt. Dyeings were therefore carried out with amounts of common salt corresponding to 0, 5, 10, 20, and 40% Glauber's salt. The results obtained are given in Table V. Comparison of these results with those in Table IV shows that, within the limits of experimental error, the amounts of Durazol Red 2B absorbed by wool and cotton at 60°, 80°, and 100°C. are unaffected when the Glauber's salt

TABLE IV
Effect of Varying the Percentage of Glauber's Salt on the Absorption of Durazol Red 2B by Wool and Cotton

Glauber's Salt (%)	Absorption (g./100 g.) Wool	Absorption (g./100 g.) Cotton	Exhaustion (%)	pH of Residual Dyebath
40°C.				
0	0.004	0.06	2.6	6.54
5	0.02	0.22	9.5	6.36
10	0.04	0.32	13.0	6.18
20	0.07	0.46	18.2	6.09
40	0.10	0.63	26.0	6.00
60°C.				
0	0.03	0.14	6.1	7.40
5	0.13	0.24	14.4	6.92
10	0.21	0.35	19.4	6.70
20	0.27	0.51	25.8	6.68
40	0.36	0.73	36.4	6.46
80°C.				
0	0.08	0.08	5.7	7.26
5	0.36	0.21	20.0	6.74
10	0.57	0.29	28.1	6.60
20	0.72	0.39	36.5	6.48
40	0.93	0.53	47.8	6.48
100°C.				
0	0.25	0.06	10.1	7.48
5	0.50	0.17	22.7	6.82
10	0.72	0.23	31.6	6.73
20	0.86	0.33	39.4	6.66
40	1.00	0.42	47.5	6.50

addition is replaced by a chemically equivalent amount of common salt. At 40°, however, replacement of Glauber's salt by common salt results in increased absorption on both fibres, the results on cotton being almost the same at 40° and 60°C.

TABLE V
Effect of Varying the Percentage of Common Salt on the Absorption of Durazol Red 2B by Wool and Cotton

Common Salt (in terms of % Glauber's salt)	Absorption Wool	(g./100 g.) Cotton	Exhaustion (%)	pH of Residual Dyebath
40°C.				
0	0.01	0.08	4.6	6.40
5	0.04	0.24	10.0	6.30
10	0.06	0.35	13.7	6.22
20	0.09	0.47	20.2	6.19
40	0.14	0.69	26.5	6.06
60°C.				
0	0.04	0.10	5.6	6.86
5	0.14	0.26	13.8	6.66
10	0.22	0.35	18.8	6.59
20	0.28	0.49	24.8	6.45
40	0.37	0.73	35.5	6.37
80°C.				
0	0.08	0.07	6.2	7.30
5	0.37	0.20	19.5	6.84
10	0.57	0.29	27.8	6.66
20	0.72	0.40	36.8	6.58
40	0.93	0.53	48.9	6.38
100°C.				
0	0.26	0.05	9.2	7.56
5	0.49	0.16	21.5	6.94
10	0.71	0.22	31.0	6.70
20	0.86	0.30	38.3	6.54
40	1.00	0.41	45.5	6.54

EFFECT OF PH—The results obtained by varying the pH of the dyebath, in presence of 20% Glauber's salt, are given in Table VI. illustrated by Fig. 7. The latter shows that, when wool and cotton are dyed in the same bath with Durazol Red 2B at different pH values, the wool is much more affected by changes in pH than is the cotton. As the pH changes from 9 to 5.5 more and more dye is absorbed by the wool, whereas the amount of dye absorbed by the cotton decreases, especially at 80° and 100°C., owing to the increasingly large amounts of dye taken up by the wool.

TABLE VI
Effect of pH on Absorption of Durazol Red 2B by Wool and Cotton

Addition	pH of Residual Dyebath	Absorption (g./100 g.) Wool	Absorption (g./100 g.) Cotton	Exhaustion (%)
40°C.				
1.0% Sodium carbonate ...	9.39	0.03	0.54	19.4
0.5% Sodium carbonate ...	8.60	0.05	0.55	19.6
None ...	7.00	0.05	0.54	19.7
0.5% Acetic acid (30%) ...	5.66	0.18	0.51	24.0
1.0% Acetic acid (30%) ...	5.28	0.25	0.51	26.2
60°C.				
1.0% Sodium carbonate ...	9.08	0.13	0.62	25.7
0.5% Sodium carbonate ...	8.34	0.19	0.59	26.4
None ...	6.72	0.33	0.52	28.3
0.5% Acetic acid (30%) ...	5.78	0.67	0.56	39.9
1.0% Acetic acid (30%) ...	5.44	0.88	0.55	47.4
80°C.				
1.0% Sodium carbonate ...	8.85	0.22	0.45	22.3
0.5% Sodium carbonate ...	8.39	0.37	0.44	27.0
None ...	7.26	0.67	0.40	36.8
0.5% Acetic acid (30%) ...	6.00	1.36	0.40	57.9
1.0% Acetic acid (30%) ...	5.57	2.05	0.35	77.1
100°C.				
1.0% Sodium carbonate ...	9.26	0.18	0.32	17.0
0.5% Sodium carbonate ...	8.90	0.28	0.30	19.7
None ...	7.50	0.83	0.28	37.2
0.5% Acetic acid (30%) ...	6.10	1.60	0.25	62.4
1.0% Acetic acid (30%) ...	5.58	2.30	0.21	82.9

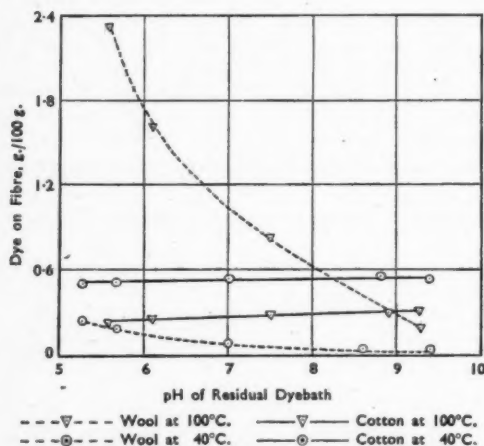


Fig. 7—Effect of Varying pH on Absorption of Durazol Red 2B by Wool and Cotton

EFFECT OF LIQUOR-GOODS RATIO—The results obtained by varying the liquor-goods ratio from 20 : 1 to 100 : 1 are given in Table VII. It is seen that, when wool and cotton are dyed together, using various liquor-goods ratios, the highest absorption on both fibres is obtained with a 20 : 1 liquor-goods ratio at all temperatures. As the ratio is increased the amount of dye absorbed falls off rapidly, both fibres being affected to about the same extent.

EFFECT OF VARYING LIQUOR-GOODS RATIO WITH CONSTANT CONCENTRATION OF GLAUBER'S SALT—In this set of experiments the liquor-goods ratio was varied from 20 : 1 to 100 : 1 while the Glauber's salt addition varied from 10% to 50%. Thus the concentration of Glauber's salt was kept constant while the liquor-goods ratio varied. The results are given in Table VIII. The fall in absorption of dye shown in Table VIII is much less marked than that shown in Table VII, the

TABLE VII
Effect of Varying the Liquor-Goods Ratio on the Absorption of Durazol Red 2B by Wool and Cotton

Liquor-Goods Ratio	Absorption (g./100 g.) Wool	Absorption (g./100 g.) Cotton	Exhaustion (%)	pH of Residual Dyebath
40°C.				
20 : 1	0.13	0.74	28.8	6.20
40 : 1	0.10	0.50	20.9	6.00
60 : 1	0.07	0.36	15.8	5.94
80 : 1	0.06	0.28	13.5	5.87
100 : 1	0.05	0.24	11.3	5.64
60°C.				
20 : 1	0.40	0.76	36.3	6.45
40 : 1	0.28	0.52	25.9	6.36
60 : 1	0.22	0.39	16.6	6.30
80 : 1	0.15	0.29	13.7	6.24
100 : 1	0.09	0.25	11.5	6.13
80°C.				
20 : 1	0.92	0.63	50.9	6.80
40 : 1	0.65	0.45	37.5	6.58
60 : 1	0.48	0.32	26.4	6.48
80 : 1	0.42	0.26	20.5	6.40
100 : 1	0.34	0.21	16.8	6.35
100°C.				
20 : 1	1.34	0.35	56.2	7.10
40 : 1	0.99	0.24	41.8	6.93
60 : 1	0.82	0.17	34.5	6.82
80 : 1	0.55	0.13	23.7	6.74
100 : 1	0.45	0.10	19.3	6.66

cotton being affected to a rather greater extent than the wool.

EFFECT OF WOOL-COTTON RATIO—The results obtained by varying the wool-cotton ratio from 80 : 20 to 20 : 80 are given in Table IX. It is seen that, when mixtures containing different proportions of wool and cotton are dyed together with Durazol Red 2B, the amount of dye absorbed by the cotton is largely independent of the wool-cotton ratio at any given temperature. In the case of wool the amount absorbed remains fairly constant at 40° and 60°C., but at 80° and 100°C. it increases as the proportion of wool in the union is decreased.

TABLE VIII
Effect of Varying the Liquor-Goods Ratio (with Constant Glauber's Salt Concentration) on the Absorption of Durazol Red 2B by Wool and Cotton

Liquor-Goods Ratio	Absorption (g./100 g.) Wool	Absorption (g./100 g.) Cotton	Exhaustion (%)	pH of Residual Dyebath
40°C.				
20 : 1	0.11	0.52	22.2	6.64
40 : 1	0.09	0.47	19.4	6.30
60 : 1	0.08	0.42	17.3	6.26
80 : 1	0.07	0.39	16.6	5.90
100 : 1	0.07	0.36	15.4	5.90
60°C.				
20 : 1	0.31	0.50	28.9	6.76
40 : 1	0.29	0.55	26.6	6.60
60 : 1	0.25	0.48	24.5	6.48
80 : 1	0.25	0.46	24.2	6.74
100 : 1	0.25	0.43	24.1	6.76
80°C.				
20 : 1	0.71	0.47	39.1	6.60
40 : 1	0.66	0.41	33.9	6.26
60 : 1	0.55	0.35	31.1	6.12
80 : 1	0.50	0.32	27.0	6.12
100 : 1	0.46	0.30	26.7	6.38
100°C.				
20 : 1	1.05	0.33	47.1	6.58
40 : 1	0.92	0.26	41.5	6.49
60 : 1	0.86	0.22	37.8	6.41
80 : 1	0.78	0.21	34.9	6.38
100 : 1	0.76	0.19	32.5	6.24

EFFECT OF VARYING THE AMOUNT OF DYE—In this set of experiments the amount of dye was varied from 0.25% to 3.0%. The results obtained

TABLE IX
Effect of Varying the Wool-Cotton Ratio on the Absorption of Durazol Red 2B by Wool and Cotton

Wool-Cotton Ratio	Absorption (g./100 g.) Wool	Absorption (g./100 g.) Cotton	Exhaustion (%)	pH of Residual Dyebath
40°C.				
80:20	0.12	0.52	13.1	6.90
60:40	0.11	0.52	18.7	6.82
50:50	0.10	0.52	22.0	6.71
40:60	0.10	0.51	23.9	6.64
20:80	0.11	0.49	27.9	6.54
60°C.				
80:20	0.29	0.52	22.1	6.78
60:40	0.31	0.54	26.2	6.69
50:50	0.30	0.54	27.5	6.60
40:60	0.31	0.53	28.6	6.52
20:80	0.37	0.53	30.2	6.46
80°C.				
80:20	0.74	0.40	43.9	6.66
60:40	0.74	0.42	41.6	6.61
50:50	0.77	0.43	40.5	6.49
40:60	0.80	0.43	38.5	6.41
20:80	0.86	0.43	33.2	6.35
100°C.				
80:20	0.70	0.32	41.6	6.64
60:40	0.76	0.32	37.7	6.58
50:50	0.78	0.32	35.5	6.46
40:60	0.82	0.31	34.0	6.33
20:80	0.94	0.32	28.9	6.26

are given in Table X. It is seen that, when wool and cotton are dyed together with increasing amounts of Durazol Red 2B in presence of a constant amount of Glauber's salt, the absorption on both fibres increases as the amount of dye is increased, the effect being most pronounced in the case of wool at 80° and 100°C.

TABLE X
Effect of Varying the Amount of Dye on the Absorption of Durazol Red 2B by Wool and Cotton

Dye (%)	Absorption (g./100 g.) Wool (a)	Absorption (g./100 g.) Cotton (b)	$\frac{a}{b}$	Exhaustion (%)	pH of Residual Dyebath
40°C.					
0.25	0.05	0.27	0.17	59.2	8.20
0.5	0.05	0.37	0.13	42.5	7.46
1.0	0.08	0.48	0.17	27.3	6.86
1.5	0.09	0.51	0.18	10.6	6.24
3.0	0.13	0.60	0.21	12.8	6.00
60°C.					
0.25	0.13	0.27	0.47	60.5	6.20
0.5	0.21	0.38	0.55	48.7	6.14
1.0	0.30	0.48	0.62	37.3	6.22
1.5	0.34	0.54	0.63	27.6	6.34
3.0	0.41	0.65	0.63	17.5	6.34
80°C.					
0.25	0.19	0.17	1.1	75.0	6.14
0.5	0.35	0.31	1.1	58.4	6.28
1.0	0.67	0.35	1.9	51.3	6.20
1.5	0.80	0.43	1.9	41.4	6.18
3.0	1.12	0.49	2.3	27.2	6.11
100°C.					
0.25	0.28	0.11	2.5	78.0	6.00
0.5	0.46	0.17	2.7	62.0	6.20
1.0	0.79	0.26	3.0	53.0	6.20
1.5	0.93	0.30	3.0	41.0	6.16
3.0	1.26	0.42	3.0	27.7	6.26

RELATION BETWEEN DYE ABSORPTION AND DEPTH OF SHADE ON THE TWO FIBRES

Visual examination of the dyed patterns showed that, in general, for the same percentage of dye on the two fibres, the wool patterns were darker than the cotton patterns. In order to obtain a quantitative evaluation of these differences a series of dyeings of increasing depth was prepared, for both wool and cotton. The amount of dye on the fibre

was obtained in each case by colorimetric estimation of the residual dyebath. Next, the dyed patterns were assessed for depth of shade in a Lovibond Tintometer. The hue of Durazol Red 2B remains very close to that of the red Lovibond filters as the percentage of dye on the fibre is increased, so it was possible to ignore the small amounts of yellow and blue required to obtain a match and to express each shade in terms of red units. The results obtained are illustrated in Fig. 8.

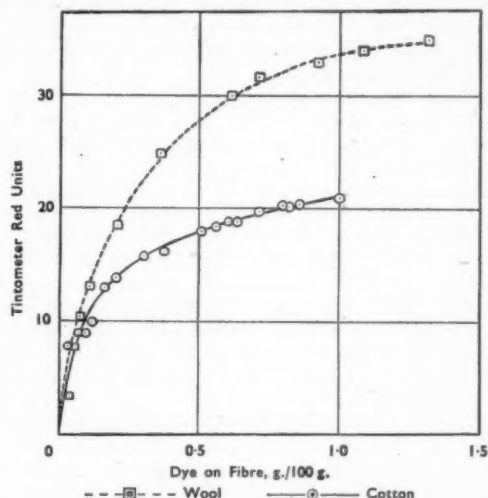


Fig. 8—Relation between the Depth of Shade and the Amount of Dye on the Fibre

Fig. 8 shows that beyond a moderate depth of shade, corresponding to about 20 Tintometer units of red, further absorption of dye by cotton results in relatively little difference in depth of shade. A similar effect is shown by wool, but the approach to saturation is more gradual and a much deeper shade is obtained, i.e. the dye "builds up" much better on wool than on cotton. Beyond a moderate depth of shade on wool, a match cannot be obtained with cotton. The divergence of the two curves in Fig. 8 indicates that, as the depth of shade increases, so does the disparity in the amounts of dye on the two fibres. At low percentages the same amount of dye on the wool and cotton will result in the same shade on both fibres. When the deepest possible shade is obtained on the cotton, this can be matched on the wool with only about one-quarter as much dye.

DISCUSSION AND CONCLUSIONS

Towards wool Durazol Red 2B behaves as a typical neutral-dyeing acid dye. In the absence of acid, dyeing is very slow at low temperatures and the rate of dyeing increases as the temperature is raised. The amount of dye absorbed from a neutral bath is small in the absence of Glauber's salt, but even with 40% Glauber's salt the absorption after 1 hr. is only 60%. In a slightly acid dyebath Durazol Red 2B is absorbed rapidly and completely, except at low temperatures (e.g. 40°C.), when the dye is aggregated in solution.

With cotton the absorption-time curves for different temperatures (Fig. 4) show that Durazol Red 2B behaves in accordance with the rule² for a rapid-dyeing direct dye. Dyeing is more rapid at the higher temperatures, but the equilibrium absorption is lower. At 100°C. equilibrium is reached in about 10 min., but more than 2 hr. are required at 40°C. The amount of dye absorbed in the absence of Glauber's salt or common salt is small; it increases steadily with increasing amounts of salt. Variation of pH over the range 3.5 to 9.5 has little effect on the absorption of Durazol Red 2B by cotton. Except with very low concentrations of dye, the degree of exhaustion of the dye-bath is likely to be poor.

When dyeing wool and cotton from the same dyebath an excess of dye was always present, except in acid dyebaths, and the two fibres dyed independently of each other. Only under conditions where the degree of exhaustion is fairly high is there likely to be competition for the available dye. Under such conditions the direct dye will tend to dye the wool at the expense of the cotton. In the experiments described the presence of wool did not greatly affect the amount of dye taken up by the cotton, but the additional amount of dye present resulted in deeper dyeings on the wool for corresponding temperatures and amounts of Glauber's salt.

Durazol Red 2B obeys the generally accepted rules for dyeing cotton in a wool-cotton union without dyeing the wool to any appreciable extent. The best conditions appear to be a temperature of 40°C., a pH above 7, an addition of 40% Glauber's salt, and the minimum possible liquor-goods ratio. It is also desirable that the time of dyeing should be kept to a minimum, because the cotton dyes more rapidly than the wool, so that the greatest difference in shade is observed in the initial stages. The importance of avoiding acidity in the filling-in bath is not sufficiently apparent in Fig. 7. In the

absence of acid the wool is only slightly tinted at 40°C., whereas in presence of 0.5 or 1.0% of acetic acid (30%), largely owing to superficial absorption of dye, the shade was almost as deep as that of the cotton, in spite of the much greater amount of dye present on the latter fibre.

A solid shade on the two fibres can be obtained by dyeing the union material for 1 hr. at 60°C., but at this temperature the wool tends to be dyed superficially. A better method would appear to be that recommended by Smith⁷, viz. dyeing for a short period at the boil, then cooling the bath and dyeing at a relatively low temperature after adding more dye and Glauber's salt. The temperature recommended by Smith for the later stages of dyeing, viz. 60°C., appears to be too high. In the absence of any auxiliary product for preventing staining of the wool, a temperature in the neighbourhood of 40°C. is more suitable for filling in the cotton.

It has been shown that Durazol Red 2B does not "build up" very well on cotton. A deep red on wool cannot be matched on cotton with this dye.

DEPARTMENT OF COLOUR CHEMISTRY AND
DYEING
LEEDS UNIVERSITY

(Received 17th January 1950)

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- ¹ Neale, J.S.D.C., **52**, 252 (1936); Hanson, Neale, and Stringfellow *Trans. Faraday Soc.*, **31**, 1718 (1935).
- ² *First Report of the Committee appointed by Council to discuss the Dyeing Properties of Direct Cotton Dyes*, reprinted from J.S.D.C., **62**, 280-285 (Sept. 1946).
- ³ Goodall, J.S.D.C., **54**, 45 (1938).
- ⁴ Boulton, *ibid.*, **60**, 5 (1944).
- ⁵ Townend and Simpson, *ibid.*, **62**, 47 (1946).
- ⁶ Fothergill, *ibid.*, **60**, 93 (1944); **62**, 319 (1946).
- ⁷ Smith, *ibid.*, **61**, 8 (1945).
- ⁸ Lenher and Smith, *J. Phys. Chem.*, **40**, 1005 (1936).
- ⁹ Robinson and Mills, *Proc. Roy. Soc., A* **131**, 576 (1931).

Notes

Proceedings of the Council

At a meeting of the Council, held at the offices of the Society, 32-34 Piccadilly, Bradford, on 8th March 1950, the proceedings included the following items of interest—

APPOINTMENT OF SCRUTINEERS—It was reported that Mr. H. Blackshaw and Mr. J. V. Summersgill had accepted invitations to serve as scrutineers for the postal ballot for Vice-presidents and Ordinary Members of Council.

ROYAL TECHNICAL COLLEGE, SALFORD—Mr. F. Farrington was nominated to represent the Society on the Applied Sciences Advisory Committee of the Royal Technical College, Salford.

PUBLICATIONS COMMITTEE RESIGNATION—The resignation of Mr. G. S. J. White from the Publications Committee was accepted with great regret.

REPORT OF THE WOOL DYES COMMITTEE—The report of the Committee on the Dyeing Properties

of Wool Dyes was approved, and it was resolved that the high appreciation and cordial thanks of the Council be accorded to the Committee for their valuable work.

MEMBERSHIP—Nineteen applications for ordinary, and ten for junior, membership were approved. One application for readmission was approved, and the loss by death of Mr. W. Hartley and Mr. W. Sugden was reported.

RETIRING MEMBERS OF COUNCIL—The President expressed cordial thanks to those about to retire (see J.S.D.C., **66**, 1 (Jan. 1950)) for their past services on the Council.

THANKS TO THE PRESIDENT—In moving a vote of thanks to the President, Mr. Barritt pointed out that this was the last meeting of the Council over which Mr. Holden would preside as President, and that he had never missed a meeting during his two years in office.

Meetings of Council and Committees April

Council—19th
Finance—19th
Publications—18th
Historical Records—5th
Summer School—25th
Diploma—3rd and 21st

Letters to the Editor

The Publications Committee welcomes letters, embodying experimental data or other items of interest to readers, for publication in the *Journal*. It not infrequently happens that a research has to be stopped before sufficient results are available for presentation as a paper. On the other hand, it may be desirable to report an interesting discovery at once, without the delay involved in carrying out a complete investigation. In both these cases, publication in the form of a letter would be very valuable.

Manchester Municipal College of Technology Scholarships and Exhibitions

The Governing Body offer six scholarships and six exhibitions varying in value up to a maximum of £65 plus approved fees if the student is resident at home, and £140 plus approved fees if resident in hostel or lodgings, to part-time Manchester students and others, tenable in any one of the full-time day courses of the College for three academic years, on condition that persons holding these scholarships prepare themselves for the degree of Bachelor of Technical Science (B.Sc.Tech.). Forms of application may be obtained from the Registrar, College of Technology, Manchester 1, and completed forms must reach him not later than 20th June 1950.

A.A.T.C.C. Annual Convention Portsmouth N.H., 28-30th September 1950

The Twenty-ninth Annual Convention of the American Association of Textile Chemists and Colorists, to be held at Portsmouth, New Hamp-

shire, on Thursday-Saturday, 28-30th September 1950, will include technical papers in the four groups—wool and worsted, cotton, synthetics, and testing and auxiliary chemicals. Further information is obtainable from the A.A.T.C.C., Lowell Textile Institute, Lowell, Massachusetts, U.S.A.

Second Canadian Textile Seminar

The Second Canadian Textile Seminar will be held at Queen's University, Kingston, Ontario, on Friday and Saturday, 15th and 16th September 1950, and any members of the Society who may be in Canada at that time will be very welcome. It may be remembered that the published proceedings of the first seminar were reviewed in the June 1949 issue of the *Journal* (p. 289). Further particulars may be obtained from J. P. Redston, Esq., 554 Briar Hill Road, Toronto, Ontario, Canada.

International Exhibition of the Laundry and Dyeing Trades, Düsseldorf 30th June-9th July 1950

Both German and foreign manufacturers will be represented at the above exhibition, dedicated to the laundry, dyeing, and dry-cleaning trades. Further particulars are obtainable from the Nord-westdeutsche Ausstellungs-Gesellschaft m. b. H., Düsseldorf, Ehrenhof 4, Germany.

Polymer Chemistry applied to Plastics

The Plastics and Polymer Group of the Society of Chemical Industry has arranged a Symposium on Polymer Chemistry as applied to Plastics to be held in the Beveridge Hall, London University, on 21st-23rd September 1950. The sessions will deal with the tools of polymer research, the relations between the structure and properties of polymers, and the theory and practice of polymerisation and polycondensation. The registration fee will be £2 2s. to non-members of the S.C.I. The Honorary Organising Secretary is Dr. N. J. L. Megson, Ministry of Supply, Room 716, Shell Mex House, London, W.C.2.

New Books and Publications

Neueste Fortschritte und Verfahren in der chemischen Technologie der Textilfasern Erster Teil

Die neuesten Fortschritte in der Anwendung der Farbstoffe

Hilfsmittel in der Textilindustrie

By Louis Diserens. Vol. III, pp. xi + 556. Basle: Verlag Birkhäuser. 1949. Price, 72 Swiss francs.

This book is the third and last volume of Part I of the series of books written by Dr. Diserens, dealing with (Part I) the latest developments in the application of dyes and (Part II) new developments in the technique of the chemical preparation of textile fibres. Reviews of the earlier volumes have already appeared in this *Journal* (J.S.D.C., 63, 29 (1947); 64, 365 (1948); 65, 235, 362 (1949)).

This volume opens with Chapter XII (121 pp.), which deals with the various printing processes for the application of metal powders and pigments, including white pigments for matt effects, the various methods for the fixation of such pigments being dealt with in detail. Included also are notes on lacquer effects, luminous pigment prints, plastic effects with fibre powder, the water-in-oil type of pigment (Aridye, Sherdye, Impralac, etc. colours), and the oil-in-water type such as the Orema colours. Tables of solvents for colours based on nitrocellulose or acetylcellulose, of delustering agents for matt printing effects, and of binding agents for pigment printing are included.

Both the oxidation (2 pp.) and the reduction (30 pp.) discharge processes are dealt with in Chapter XIII (64 pp.). The latter includes notes

on the various discharging agents, on the precautions to be taken with various types of dyes and types of materials, and on methods for improving faulty discharges. Reserving agents and processes are also included, and the chapter closes with tables of auxiliaries to be used in discharging and reserving processes, together with lists of reducing agents.

Chapter XIV (30 pp.) deals with solvents used in printworks and dyehouse. A table (16 pp.) of these solvents listing makers, constitution, literature references, and use is included.

Chapter XV (194 pp.) covers the wide range of auxiliary products used particularly in the printworks. Included are notes on froth prevention, emulsifying agents, preservatives for thickeners, "sighteners" for colourless printing compositions, and fluorescent materials. Thickening agents naturally receive considerable attention, the naturally occurring products, vegetable, animal, and mineral, being followed by their synthetic competitors. Textile washing agents and detergents are dealt with under the three main headings of anion-active, cation-active, and non-ionic compounds, but various new washing agents receive special mention. Useful tables summarise the information and give equivalents.

This volume, like the others in this series, should be of the greatest value to students and, as a book of reference, to the textile printer.

Author and patent indexes and corrections to all the previous volumes are listed, while very useful indexes to all three volumes complete the work and will be a great convenience to the reader. This particular volume is likely to prove of special interest, as the scope of the volume covers matters of common interest to all printers, e.g. thickeners, discharge and reserving agents, and covers also some more unusual processes, about which the printer may wish to have a book of reference.

The volume closes with literature references, lists of textile printers in the European countries and in America, Africa, Australia, and Asia together with, in most cases, the numbers of printing machines in operation.

The book is excellently arranged and indexed and is well referenced. The main principles involved in the processes are explained, and the newer developments in the various countries are listed with references. The author is to be congratulated on the freedom from errors and the publisher on the excellent production and clear print of the whole series.

A. THOMSON

An Advanced Treatise on Physical Chemistry Volume I

Fundamental Principles The Properties of Gases

By J. R. Partington. Pp. xlii + 943. London: Longmans, Green & Co. Ltd. 1949. Price, 80s. 0d.

Professor Partington's new book is what it professes to be, an advanced treatise on physical chemistry. It is not intended for the beginner and it has no pedagogical purpose, but it will be of great value to the senior student, the teacher, the researcher, and the professional physical chemist

who feels the need of a good reference book at his elbow. It is, however, much more than a dry-as-dust compendium; its historical paragraphs give it perspective, and the pungent quotations and shrewd comments make it both readable and stimulating.

There is a Mathematical Introduction (115 pp.), beginning with the elements of the calculus and ending with differential equations and Fourier's series. The fundamental principles are dealt with in sections on Thermodynamics (119 pp.), the Kinetic Theory of Gases (59 pp.), Statistical Mechanics (84 pp.), and Wave Mechanics (42 pp.); then follow sections on Thermometry, High and Low Temperatures (126 pp.), and then a long section on the Properties of Gases (389 pp.). The next volume will treat solids and liquids, and the whole work is to be complete in three or four volumes.

The author emphasises that the book is on physical chemistry, not chemical physics nor mathematical physics, and he defines physical chemistry with van't Hoff as "the science devoted to the introduction of physical knowledge into chemistry with the aim of being useful to the latter". There is a good balance between theory and experiment; and there are empirical relations and tables of useful data which have been sifted by the long experience of the author. One of the most valuable features of the book is its many references, which provide a comprehensive but critical guide to the literature; if one cannot find what one wants in the text, a signpost to further knowledge is sure to be there.

Physical chemists owe Professor Partington a debt of gratitude for undertaking this arduous task, and will look forward to the appearance of the further volumes. The price is high and will exclude some would-be purchasers, but perhaps is reasonable on present-day standards. J. W. BELTON

Methods of Test for Textiles B.S. Handbook No. 11

Pp. 311. London: British Standards Institution. 1949. Price, 21s. 0d.

The main intention of this handbook is to place on record those methods of testing textiles which have received some degree of general acceptance in this country. The sources of the methods of test are the established textile research associations, the Society, and the Textile Institute. The book is divided into eight sections, dealing respectively with textile terms and definitions, atmosphere and conditioning, fibres, yarns, fabrics, colour fastness, chemical tests, and narrow fabrics. The fastness tests constitute a revised version of the *Second Report of the Fastness Tests Committee* published in April 1948 (J.S.D.C., 64, 133-145).

C. J. W. H.

A.S.T.M. Standards on Textile Materials (with Related Information)

Prepared by A.S.T.M. Committee D-13 on Textile Materials. Pp. xiii + 574. Philadelphia: American Society for Testing Materials. 1949 (issued annually). Price, \$4.50.

The annual publication of the American Society for Testing Materials in which are collected together

the standards on textile materials prepared by Committee D-13 needs no introduction to readers of this *Journal*. The volume under review, published in October 1949, closely resembles its predecessor, although a few additions have been made. These include tentative proposals for determining the yarn number of yarn taken from fabric, for measuring the stretch in hosiery, for testing asbestos lap and kraft yarn, and for obtaining a sample from a consignment of wool in bales or bags. There are two additions to the useful appendixes: one is a method for determining the amount of vegetable matter in sound wool and the other is a suggested method of test for magnetic rating of asbestos used for electrical purposes. It is usual to find in the yearbook extended abstracts of papers presented to Committee D-13 during the year, and the three published in the present volume are concerned with X-ray studies on fibres, native cellulose being discussed by W. A. Sisson, synthetic fibres by A. F. Smith, and keratin and other protein fibres by G. C. Nutting. The yearbook is a valuable reference book, and all interested in dyeing and textiles should have access to it. C. S. WHEWELL

Screen Printing

By W. Taussig. 2nd edition 1949. Pp. 81. Manchester: The Clayton Aniline Co. Ltd. No price.

The first edition of this book was published in 1947 and was reviewed in this *Journal* (64, 152 (April 1948)), to which reference should be made for general comment.

The second edition is a revised and extended version. The inclusion of sketches illustrating the selection and installation of equipment, and of photographs taken at modern screen printing works, are excellent new features. The section on printing styles, which suffered from over-compression in the first edition, has been opened up to advantage, and more nearly represents the declared intentions of the author.

The whole work is now a better balanced production, on which the author is to be congratulated.

J. S. HEATON

Edmund Potter and Dinting Vale

By J. G. Hurst. With a Foreword by R. M. Lee. Pp. 89. Manchester: Edmund Potter & Co. Ltd. 1948.

The story of Edmund Potter is that of a shrewd, courageous industrialist of the last century who, with his cousin Charles, established a printworks at Dinting Vale in 1825. Six years later the cousins went bankrupt and parted company, but Edmund set about rebuilding the business, and succeeded so well, in spite of many difficulties, that by 1873 Dinting Vale had become the largest printing unit in the world. His outlook was liberal in the widest sense. By his writings and his local provision, he did much to further the cause of education for all. He played a prominent part in business and public affairs in and outside Manchester, and in 1861 entered Parliament as Member for Carlisle. In Parliament he served on many committees until his retirement from business and politics in 1873, ten years before his death. Many tributes were

paid to him during his lifetime, but the greatest honour was election as a Fellow of the Royal Society.

The story of Dinting Vale and the world-famous Potter's prints is continued to the end of the century—by which time the Potter connection had been severed by death and the firm joined with others to form the Calico Printers' Association—then on to 1947, thereby presenting the reader with a picture of the rise and decline of textile printing as typified by the history of one works. The author has had a difficult task in attempting to produce a book free from tedious sections but has achieved a considerable measure of success. The work is well produced and suitably illustrated. Of particular interest is the Potter family tree. Whilst the book will make its strongest appeal to those connected with textile printing, it is well worth reading by those whose interests lie in the fields of economic, political, and social history.

A. W. DOYLE

Modern Textile Design and Production

By R. H. Wright. Pp. viii + 168. London: National Trade Press Ltd. 1949. Price, 42s. 0d.

Textile design is a subject that has many aspects. The producer, dyer and colourist, merchant, artist, and weaver all possess definite and distinct ideas as to what it means to them and their own specialised branch of the industry.

Many books, technical and otherwise, have been written giving knowledge, information, and opinions on most of the aspects referred to above, but there have been surprisingly few which have attempted to deal with the subject comprehensively. The student of textile design has had to rely exclusively upon technical works on fabric structure or general surveys of historical and decorative fabrics, where seldom, in either case, have the practical and economic conditions of the textile industry been allowed to intrude.

This book by Mr. R. H. Wright attempts boldly to present a comprehensive picture and to correct the omission. He says in his conclusion—

As long as I can remember there have been no books available treating textile design in a practical sense and using commercial examples in every possible instance. . . . I have attempted to instance how manufacturing processes are involved with design and design limitations and so give a practical background The book, therefore, will be of use to all those handling textiles from the weaver to the merchant.

It may be said that, in the writer's opinion, Mr. Wright's study of textile design and production does achieve almost entirely what he has set out to do. It is a book not only for the student of design but for everyone concerned with high quality in the production of modern fabrics. Mr. Wright is in an exceptional position to state his views with authority, having been a weaver, teacher, salesman, producer, and designer for both woven and printed materials. While stressing practical considerations (and showing numerous well chosen illustrations from commercial materials), the book does not accept the view that the manufacturing and distributive systems are necessarily static, but indicates many possibilities of improvement in

both respects. The structures of fabrics, the uses of various yarns, natural and synthetic, dyeing, and finishing are treated in some detail, and adequate references are given for further study.

The only criticism offered is that the chapter on Colour and Weaves (p. 44) would have been improved by a somewhat stricter investigation of the effects of mixing coloured yarns by interweaving. This results in an additive colour admixture as distinct from a subtractive admixture, where, in the latter case, colours are overlaid or mingled in dyes as pigments are on the palette. In the former case, red, blue, and yellow are certainly not primaries, as interweaving of blue and yellow threads produces a silvery grey, not green. In other respects the chapter on Colour and Weaves shows admirable illustrations of experimental colour stripes displaying the effects of coloured yarns and different weaves.

In conclusion, Mr. Wright's book provides a valuable introduction to the textile industry; emphasis is laid upon considerations of design and design limitations; technical processes are described in addition to the system of distribution and of studio practice; in short, it may be recommended, with the appropriate technical handbooks referred to in the text, to the young person entering any branch of the industry. It is a fairly expensive book, but it is undoubtedly good value for money—especially in these days, when good textbooks are so difficult to procure.

J. CHIRNSIDE

Industrial Hygiene and Toxicology

Volume II

Edited by Frank A. Patty, with eighteen contributors. Pp. xxviii + 606. New York and London: Interscience Publishers. 1949. Price, 120s. 0d.

The biggest modern contribution to the literature of industrial physiology and toxicology has undoubtedly been American. Contributions of quality have come from Britain and Germany, but in scope and in the expenditure of money the American attitude towards the subject has been and is altogether on a different scale. The Federal Government has established bureaux of information and centres of experimental investigation of industrial hygiene and toxicology, the reports from which are of the greatest value to workers in these fields throughout the world. The most beneficial results for the working masses have come not from a sentimental idealism or a paternal humanitarianism but from a scientific appraisal of the effects of plant, process, and environment on the health and efficiency of the worker.

It is thus that industrial hygiene has become or is at least becoming not a sporadic effort to improve industrial life but an integral part of the industrial process itself. A realisation of the need for such an approach to industrial hygiene came very late in British industry, and even now there is much obscurity in the minds of the national administrators as to what is required. Some effort is being made both by the Government and by some of the largest industrial organisations to provide industry with the necessary information

on the industrial toxicology of the multifarious chemical elements and compounds before introducing them into process or application.

In regard to already known compounds the volume before us is an attempt to present in a more or less readily assimilable form extant knowledge on the toxicology of the main industrially important elements and compounds. Those engaged in the more complex organic chemical industries will have no difficulty in complaining that many very important organic compounds are not mentioned at all. This is inevitable, and it would be quite unfair to expect it to be otherwise.

The various authors have tried, when dealing with broad groups of chemical compounds, to present the symptoms, manner of absorption and excretion, mode of toxic action and pathology, effect on man of the whole group in a sort of summary form, and to follow this by the physical and quantitative physiological properties of specific members of the group. There is much to be said for this approach, especially as the book will be eagerly perused by non-medical and often non-scientific people. Since the information is, in the main, culled from the literature (mainly American), it is necessarily in some respects uncritical—a matter of some importance, since experimental toxicological methods are widely different and interpretation from various species of animal is difficult. The application of such data to the human subject is the point at issue, and the tendency is naturally to err on the side of safety in recommending permissible concentrations in the plant atmosphere. The important thing is to regard such figures, which are inferred mainly from animal experiment, as guides, and each factory should ideally compile records of analyses of the atmosphere of the plant parallel with those of signs and symptoms of illness among the workers.

This second volume of a notable work offers a mine of information, and a quite heroic attempt has been made in the last chapter by the Editor, Dr. F. A. Patty, and Dr. F. R. Holden to give a résumé of potential exposures to toxic materials in a wide variety of industries. The authors of this chapter would doubtless not claim that much can be learnt of an industry and its hazards from the short section here devoted to it, but the effort was worthwhile if it serves to emphasise that industrial toxicology, properly so called, is a subject which must be presented in relation to industry, and that the advice given to industry which is based solely on academic laboratory study is of little value and may be quite misleading. This book will be found valuable not only because of its helpful presentation but also because of its carefully chosen references, which can form the basis for a detailed study of any particular substance or group of substances. Except for one or two notable articles (e.g. Nitro and Amino Compounds of the Aromatic Series, by Dr. D. O. Hamblin), the book is singularly free from theoretical considerations. This perhaps was due to a conscious preference for purely practical matter, but it must be remembered that industrial toxicology abounds in obscure problems even in what might appear the most obviously

important matter, e.g. cause of death, mode of production of narcosis by certain gases and solvents, mechanism of production of convulsions,

final disposal of absorbed toxic material, and many others. Perhaps the practical man does not need to bother about these things. M. W. GOLDBLATT

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University.

Bard & Wishart

INDIGOSOL BLUE IRS—This solubilised vat dye, made by Durand & Huguenin S.A., Basle, is recommended for producing pure blues, slightly redder and slightly less fast to chlorine than those obtained by using the Blue IBC brand. It may be applied by normal dyeing methods, but since its affinity for cellulosic fibres is low, it is preferable to use a padding technique.

The application of Indigosol Blue IRS in printing is described in a second card. It can be used (alone or in mixtures) for direct printing on all types of cellulosic material; a pure white may be reserved by the Resist X process, and coloured reserves obtained under Aniline Black and resists on naphtholated grounds. Some fastness grades when dyed on cotton include—Light 7-8, soda boiling 5, chlorine 2.

INDIGOSOL RED AB—This is a further addition to the range of solubilised vat dyes. It is recommended for producing bright bluish reds, of moderate fastness to light and alkaline wet treatments, on all forms of cellulosic material. In the presence of sodium sulphate, it has relatively high affinity for cellulose and may be dyed on the jigger or winch and in circulating-liquor machines. In the absence of salts, it can be applied by normal padding methods.

The use of Indigosol Red AB in printing is described in a separate card. It is of use for producing medium and full reds by direct printing, while excellent white reserves can be readily obtained, and dyeings are dischargeable with neutral hydrosulphite. Unlike many pink and red dyes of this class, the undeveloped dye is only slightly affected by exposure to light, which is of considerable importance in screen printing. Some fastness grades when dyed on cotton include—Light 5-6, washing at 40°C. 4-5, water 5.

INDIGOSOL DYEINGS ON WOOL—This card contains dyeings on wool piece of twenty-eight Indigosol dyes, each of which is shown in two depths. The dyeings have been produced by a new short dyeing process in which the total time required for dyeing and oxidation has been reduced to 1-2 hr. Except in the cases of three dyes, dyeing is carried out in a neutral bath at 85°C., exhaustion being promoted by adding Glauber's salt in portions during the dyeing and premature oxidation prevented by adding small amounts of Rongalite C. Except with Indigosol O, O Extra, and OR, where an acid solution of sodium nitrite is employed, the dyeings are developed at 85°C. in an acid solution of ammonium thiocyanate and potassium dichromate. The usefulness of the card is increased still further by the inclusion of a range of thirty-two mixture dyeings.

Gelgy Co. Ltd.

DIPHENYL FAST BLUE 7GL—This direct cotton dye yields greenish blues of good fastness to light and wet treatments, and is particularly recommended for use alone and as a component of bright greens on cellulosic materials which are to be crease-resisted. Wool is dyed much less deeply than cotton, acetate rayon is completely reserved, and nylon only slightly stained when it is applied to unions of these fibres and cotton. White discharges are obtainable on light and medium grounds. Some fastness grades on cotton include—Light 5-6, washing at 40°C. 4, perspiration 5.

CUPROPHENYL RED BL—This direct cotton dye is recommended for use alone and in mixtures with dyes of the same class on all types of cellulosic materials to give dyeings having good fastness to light and wet treatments when aftertreated on the fibre with copper sulphate. In the presence of cotton, effect threads of wool, silk, and nylon are only slightly stained and acetate rayon is completely reserved. Solid dyeings may be produced on wool-

cellulose mixtures in conjunction with single-bath chrome or neutral-dyeing acid dyes. Dyeings are not dischargeable. Some fastness grades include—Light 6, washing at 60°C. 5, perspiration 4-5.

SETACYL DIRECT ORANGE 4R—This dispersed dye gives bright oranges on acetate rayon and bluish reds on nylon. It is recommended for use alone and in mixtures on all types of acetate material on both the winch and the jigger. It may be discharged with hydrosulphite, but owing to the possibility of sublimation it is only of limited interest for printing. Some fastness grades on acetate rayon include—Light 5, washing at 60°C. 4-5, perspiration 4-5.

TINOLITE COLOURS—These are stable, concentrated pastes of insoluble coloured pigments, which require only to be diluted with water, padded or printed on to the material, dried, and then heat-treated at 135-140°C. for 5-10 min. to yield colours of good fastness to light, washing, and perspiration. The pigment is fixed to the fibre by polymerisation during the heat treatment of the synthetic resin present in the emulsion. A range of ten colours is available, eight of which can be used for producing coloured discharges on dyed grounds. They are recommended for producing pale to medium shades on cellulosic fabrics when applied by a padding process and for any depth by printing by either roller, screen, or block methods. The fastness to rubbing may be increased by incorporating unpigmented emulsion, Tinolite Clear, with the pigmented material. Tinolite colours applied by padding or printing may be used in conjunction with any other type of dye provided complete fixation of the former is ensured by curing at high temperatures. If the material is to be crease-resisted, it is simply padded or printed with the Tinolite colour, dried, padded in the urea-formaldehyde precondensate, and then heat-treated in the normal manner, when the pigment is fixed and the crease-resist finish developed at the same time.

ERIOCHROME DYES ON NYLON—This card contains dyeings of twenty-nine chrome dyes, all except one shown in two depths, six Polar dyes recommended for shading purposes, and six mixtures. A modified afterchrome process is recommended in which the acid dyeing is chromed at the boil for 60 min. using 0.5-4% bichrome and 0.5-2% sulphuric acid, care being taken to ensure that the acid dyebath is completely exhausted before chroming is carried out.

SETACYL DIRECT DYES ON ACETATE RAYON—This card contains dyeings on knitted acetate fabric of twenty-two dispersed dyes illustrated in two depths. Four mixture dyeings, a light and medium green and a medium and dark brown, are also shown. Information regarding the rate of dyeing, temperature range, and building-up properties of each dye is given alongside the patterns together with relevant fastness data.

SETACYL DIRECT DYES ON NYLON—This pattern book contains dyeings on nylon piece of the same range of dyes as shown in the previous card. The method of presentation of the patterns and information is identical, so that the hue and depth of the dyeings and the fastness properties of individual dyes on the two fibres may be readily compared. Six mixture dyeings are also included.

SOLOPHENYL AND DIPHENYL FAST DYES—This pattern card contains dyeings on mercerised cotton piece of the complete range (thirty-nine) of Solophenyl dyes and those of the Diphenyl Fast range (thirty-four) whose light fastness on cotton is not less than 4. In the case of the Solophenyl dyes, each is shown in four depths, while the Diphenyl Fast dyes are illustrated in three depths of shade. Figures for the fastness of dyeings to water and washing are given for medium and light shades as are also details of the effects on hue and fastness to light of crease-resist finishing.

Reports on German Industry

Niers Method for Purification of Effluents

H. Jung and W. Schroeder. FDX 736* (PB 73,956; Microfilm AA 233).

A paper of 47 pp., in German, describing the Niers method for treating effluents, particularly those from the textile and leather industries. The treatment consists essentially in passing the effluent over scrap iron, which is kept in suspension, with simultaneous aeration of the liquor by a stirrer, and then passing it to settling tanks. The method has the advantages of cheapness, lesser bulk of the sediment, and not increasing the dissolved matter.

C. O. C.

I.G. Farbenindustrie A.-G., Hoechst and Ludwigshafen Emulsifying Agents

FD 564/47* (PB 3867).

Microfilm of a report (36 pp.) by Allied investigators on work done on emulsifying agents by the I.G. Fourteen different brands of Emulphor are described, as well as the Dismulgans and Humectol CX and OL conc.

C. O. C.

I.G. Farbenindustrie A.-G., Hoechst Povimale—Copolymers of Maleic or Fumaric Acid or their Derivatives with Polymerisable Olefinic Compounds, Persistol LB

FD 2362/49* (PB 17,668).

A microfilm of a lecture, in German, which includes *inter alia* an account of Povimal MA, maleic anhydride-vinyl methyl ether copolymer, which can be added to cellulose acetate spinning solutions; the filaments formed from the latter do not become cloudy in boiling water and have affinity for basic dyes. Aftertreatment of these filaments with nitrogenous bases gives them the same dyeing properties as wool. Persistol LB, maleic anhydride-vinyl octadecyl ether, is used as a laundry-fast water-repellent for cellulosic fibres.

C. O. C.

I.G. Farbenindustrie A.-G., Leverkusen Phosphonium and other Mothproofing Compounds Galloyanine and Phthalocyanine Dyes Rayon Manufacture and Acetylated Cotton

FDX 704* (PB 74,910; Microfilm T 27).

A microfilm of many research and works reports on the manufacture of cellulose acetate rayon with some on the manufacture of acetylated cotton and viscose and cuprammonium rayons. There are seven reports, written in 1936-38, dealing with research on phosphonium mothproofing compounds, and one on work on methoxymethyl esters of organic acids as mothproofing agents. Two reports deal with work on galloyanine dyes and three with work on phthalocyanine dyes and their intermediates.

C. O. C.

I.G. Farbenindustrie A.-G., Griesheim Intermediates for Dyes—Soligen Driers Miscellaneous Chemicals

FDX 569* (PB 12,271; Microfilm C 20).

A report, prepared by the plant managers, giving details of their equipment, an account of research and laboratory work done during 1937-44, and a list of 266 products made at this works. This last list gives the trade name, chemical composition, amount made during each of the years 1937-44 inclusive, principal uses, and details of the manufacturing process used for each product. These products were mainly dye intermediates, but include the full range of Soligen driers and some miscellaneous products.

C. O. C.

I.G. Farbenindustrie A.-G., Frankfurt-a.-M. Properties and Applications of Indanthren Dyes II—Level Dyeing Properties

FD 2323/49* (PB 19,933).

Microfilm of pp. 40-108 of a book in German. It divides the Indanthren dyes into five classes. Tables show the effects of Poregal O and OK on the various dyes. Suitable combinations are indicated, and numerous tables deal with the dyeing of mixtures of cotton and rayon.

C. O. C.

I.G. Farbenindustrie A.-G., Frankfurt-a.-M. Properties and Applications of Indanthren Dyes FD 2322/49* (PB 19,933).

Microfilm of Parts III and IV of a book in German. Part III, pp. 109-239, deals with the properties of the individual dyes. There are twenty-seven double-page detailed tables describing the make-up of the baths, and eight double-page tables indicate the behaviour of the dyes during the crease-resist and Trubenising processes. Effects of temperature and hard water are given, and also the sensitivity to light of the sodium leuco compounds.

Part IV consists of eighty double-page tables giving (a) strength ratios, (b) fastness on cotton, rayon, and silk, (c) recommended methods of application, and (d) special properties.

C. O. C.

Deutsche Gold- und Silberscheideanstalt vormals Roessler (Degussa), Konstanz Swelling and Hydrophobing of Regenerated Cellulose—Silicic Esters as Auxiliary and Finishing Agents—Sodium Chlorite in Cotton Bleaching

FDX 720* (PB 73,508; Microfilm M 37).

A collection of 116 laboratory reports written in German during 1943-46. Among them are five dealing with work on the swelling of regenerated cellulose fibres and its prevention by treatment with formaldehyde, two on the use of sodium chlorite in cotton bleaching, and another two on work on organic silicates as non-slip, scrooping, and finishing agents, a 50% aqueous emulsion of tetrabutyl silicate being found exceptionally suitable for such use.

C. O. C.

Vereinigte Glanzstoff Fabriken, Obernburg and Seehof Rayon Research

FDX 712* (PB 74,235; Microfilm D 300).

A large number of research reports, written during 1941-43, on various aspects of the manufacture of viscose rayon, including many on reducing its swelling properties, and on synthetic fibre-forming polymers.

C. O. C.

I.G. Farbenindustrie A.-G., Leverkusen Analytical Methods—History of Naphtol AS Azo Dyes for Acetate, Cuprammonium, and Viscose Rayons

FDX 668* (PB 70,424; Microfilm E 21).

Copy of 260 inorganic and organic analytical methods used by the I.G., including about 60 dealing with analysis of Naphtols and other components of azoic dyes. There is also a 42-pp. history of Naphtol AS and two classified lists of azoic dyes for acetate, cuprammonium, and viscose rayons with tables of their light fastnesses.

C. O. C.

I.G. Farbenindustrie A.-G., Ludwigshafen Determination of Sugar and Dextrin in Methyl Violet Preparations

FD 1543/49* (PB 70,192).

Various methods of determining the amounts of sugar and dextrin in Methyl Violet preparations are described.

C. O. C.

* Material available for inspection at, and photocopies available from, T.I.D.U., Board of Trade, Lacon House, Theobalds Road, London W.C.1, or (under PB No.) from Office of Technical Services, Department of Commerce, Washington D.C., U.S.A.

Abstracts from British and Foreign Journals and Patents

(The Titles of Patents are abridged and modified)

I—PLANT; MACHINERY; BUILDINGS

Chemical Engineering Unit Processes Review. *Ind. Eng. Chem.*, 41, 1821-1934 (Sept. 1949).

Sixteen papers reviewing developments in 1948 are presented in the second annual unit processes review. Subjects reviewed include—alkylation, amination by reduction, ammonolysis, esterification, fermentation, Friedel-Crafts reactions, halogenation, nitration, oxidation, polymerisation, and sulphonation. W. K. R.

PATENTS

Apparatus for Producing Collagen Filaments. A. Cresswell and American Cyanamid Co.

U.S.P. 2,485,957
and 2,485,958.

Package Drying. F. W. Koster, L. A. Oberly, and American Viscose Corpn.

U.S.P. 2,485,609.

The packages to be dried are carried by a foraminous support which moves in a cyclic path along part of which there is a high-frequency electric field. At the same time hot air is passed up through the support and above the packages, so as to facilitate removal of moisture vaporised by the dielectric heating of the packages and prevent its condensing on the machine. C. O. C.

Web Straightener. Johnson & Johnson (Gt. Britain) Ltd.

B.P. 633,104.

The fabric is illuminated so that equal light intensity is reflected towards the opposite edges of the fabric when the web is perpendicular to the warp. Any difference between the light reflected to the opposite edges actuates a device which restores the web threads to their correct position. C. O. C.

Selvege Feelers. Allmanna Svenska Elektriska A.-B. (A.S.E.A.).

B.P. 633,871.

A finger which feels the selvedge operates an electric contact device so that the adjusting power of the contact apparatus is independent of the power with which the finger is pressed on to the fabric and of its range of insensibility. C. O. C.

Web-spreading Device. W. H. Corn and Ecusta Paper Corpn.

U.S.P. 2,486,121.

The web passes over a bar having an extending strut placed at its centre. A stay fixed to the ends of the bar is tensioned over the strut so as to bow the bar, the degree to which the strut is extended governing the degree of bow in the bar. The extension of the strut can be varied while the web is passing over the bar. C. O. C.

Continuous, Tensionless, Wet Treatment of Cloth in Open Width. Rodney Hunt Machine Co.

B.P. 631,279.

The cloth is passed through the machine by frictional engagement with rollers whose surface speed is greater than that at which the cloth leaves the machine, this latter speed being kept constant. This means that there is scarcely any tension in the cloth. If the cloth shrinks there is an increased pull of the rollers on the cloth with slightly less slippage, so that the cloth is drawn into the machine slightly faster, when the tension in it decreases to the original condition, the reverse occurring if the cloth stretches. C. O. C.

Open-width Drying. Hunt & Moscrop Ltd. and J. Sharpe.

B.P. 633,292.

In drying machines of the type in which the material is carried by a conveyor along an upper chamber and back along a bottom chamber a common fan scroll is used for each pair of fans respectively serving the upper and lower chambers. The two air streams from the fans are completely isolated from one another by the scroll, which serves not only to direct the air on to the surface of the material but also as the partition between the fans serving the upper and lower chambers respectively. C. O. C.

Heat-treating Fabrics. W. H. Shields.

U.S.P. 2,485,072.

The moist fabric and a wrapper are together wound on to an electrically conducting core. The assembly is then

surrounded with an electrical conductor. The core and the conductor are then connected in a high-frequency circuit so that the field passes through the roll and heats it. C. O. C.

Steaming of Textiles. G. R. Holroyd. B.P. 633,135.

Textiles can be thoroughly impregnated with steam without danger of condensation by placing them in a chamber and evacuating the air from it. Steam is then admitted into the chamber at $> 100^{\circ}\text{C}$. and above the condensation point prevailing in the chamber, this being controlled by heating the chamber from the outside. The falling vacuum in the chamber is broken before condensation takes place. C. O. C.

Embossing and Printing Wallpaper, Textiles, Plastics, etc. A. Becker and Ashley United Industries Ltd.

B.P. 631,849.

The material passes between an embossing roller and a co-operating roller. An inked design is applied to the embossing roller. There may be printing rollers before and/or after the embossing roller. All the rollers and the design-applying means are coupled by toothed gearing to rotate in synchronism. C. O. C.

Pin Control for Web-folding Machine. N. Bishop and Time Inc.

U.S.P. 2,486,703.

Press Plates for the Heads or Clamping Plates of Garment-steaming and -pressing Machines. Scientific Engineering & Manufacturing Co. and D. A. Freeman.

B.P. 633,150.

Pressing Sleeved Articles in One Lay. Prosperity Co. Inc.

B.P. 633,495.

Applying Transfers to Socks and other Garments. C. G. Newton.

U.S.P. 2,484,901.

Portable Device for producing Pressure Waves within the Audible Range in Washing Machines. G. E. Atkins.

B.P. 628,142.

Extremely delicate fabrics can be washed without harm if they are immersed in a detergent liquor and then subjected to pressure waves at approx. 6000 cycles or 12,000 pressure waves per minute, the pressure waves being set up by a diaphragm moving through approx. $\frac{1}{8}$ in. An electrically operated, portable device for producing these waves is described; it is readily affixed to any suitable tank, etc. C. O. C.

Inhibiting Lateral Shrinkage of Paper during Drying. G. L. Bidwell.

U.S.P. 2,484,676.

The paper is held between a pair of endless blankets as it passes over the drying rolls. The rolls are freely rotatable to equalise longitudinal tension in the paper as it is being dried. The blankets are held firmly against the paper to prevent it from shrinking laterally. C. O. C.

Multicolour Silk Screen Printing Machine for Shaped Articles. T. S. Bauman and Owens-Illinois Glass Co.

U.S.P. 2,484,671.

Measuring the Drying Time of Surface-coating Materials. Beck, Koller & Co. (England) Ltd., H. W. Keenan, and J. H. Jellinek.

B.P. 633,586.

Coating Webs of Sheet Material. John Waldron Corpn. and C. A. Dickaut. (X, p. 307.)

II—WATER AND EFFLUENTS

PATENT

Non-foaming Compositions for Conditioning Boiler Feed Water. Dearborn Chemical Co. and L. O. Gunderson.

B.P. 631,775.

A mixture of a protein, tannin, alginate, gum arabic or polyuronic acid derivative, and a surface-active, hydrophobic organic substance containing quaternary N, COO, O, COOH, OH, CO, SO₃, SO₃, NH SO₃, N, NH, NCO, NHCO, CO₂, CS₂, NH₂COO, NH₂CS₂, PO₄, or SH radicals either directly interconnected or spaced by $< 6\text{C}$, at least two of these radicals each having a chain of $> 11\text{C}$ attached, is used. C. O. C.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Properties of Technically Important Hexavalent Chromium Compounds. W. H. Hartford. *Ind Eng. Chem.*, 41, 1993-1997 (Sept. 1949).

Published information on many physical properties of the industrially important chromium compounds and their aqueous solutions is either lacking or based on the use of impure material or obsolete techniques. Doubtful published values have been checked, and new data are presented to provide reliable information on the following properties of sodium, potassium, and ammonium dichromates, sodium and potassium chromate, and chromium trioxide—physical appearance, crystal structure, density, and m.p. of the solid, transition points between hydrates, eutectic with water, solubility in water, density, f.p., pH, heat capacity, and viscosity of aqueous solutions. A comprehensive bibliography is appended.

W. K. R.

Protective Colloid Action of Detergents. K. Lindner. *Melliand Textilber.*, 31, 58-61 (Jan. 1950).

Interfacial activity (*ibid.*, 29, 203 *et seq.* (1948)) and protective colloid action are the two chief characteristics of a useful detergent. A process is described for the quantitative determination of protective colloid action and consists in the production of dispersions of soot by means of two solutions of detergents of different strengths, and measurement of their opacity by photoelectrical methods. It is shown that not all products with a strong interfacial action are good protective colloids, and that substances with little or no interfacial action can be good protective colloids.

B. K.

Effect of Various Surface-active Agents on the Penetrating Power and Stability of Calcium Hypochlorite and Bleaching Powder Solutions. J. T. Scanlan, A. J. Stirtion, D. Swern, and E. T. Roe. *Amer. Dyestuff Rep.*, 38, 455-458 (13th June 1949).

Of 130 commercial surface-active agents tested for their effect on the penetrating power and stability of conc. solutions of calcium hypochlorite and bleaching powder, 113 were completely ineffective. In conc. calcium hypochlorite ($[\text{OCl}^-] = 12.7\%$) only 0.5% Tergitol 08 and 1% Gardinol LS showed satisfactory penetrating properties which were retained for > 21 hr. and did not accelerate the decomposition of the hypochlorite. In conc. bleaching powder solution ($[\text{OCl}^-] = 4\%$) 1% of Tergitol 08, Naccosol A, and Novanacco, and 2% Ultrawet D4 and Sulfate were similarly satisfactory. In dilute solutions of both bleaches, however, Tergitol was somewhat less effective than some of the other products mentioned.

W. K. R.

Starch and Metal Salts. R. Haller. *Melliand Textilber.*, 31, 49-50 (Jan. 1950).

Compounds formed from starch and metal salts are discussed, and have been found to be adsorption and not chemical compounds. The adsorbed metallic oxides affect the behaviour of starch to a considerable extent, especially with respect to the action of enzymes. The connection between the foregoing and the fixation of prints of mordant dyes is described. A modified starch prepared by Runge by treatment with sulphuric acid diluted with alcohol is found to belong to the group of soluble starches.

B. K.

Polyurethans. V—Low-molecular Conversion Products of Diisocyanates. S. Petersen. *Annalen*, 562, 205-229 (1949).

The interaction of diisocyanates with a large number of other compounds is discussed. Many of the products form stable water-soluble adducts with sodium bisulphite. Such solutions are used for impregnating textiles, the adduct being then decomposed and the compound left polymerised in the fabric.

C. O. C.

PATENTS

Cold-swelling Starch Products. N.V. W. A. Scholten's Chemische Fabrieken. B.P. 632,785.

A mixture of starch or a starch derivative, not > twice its weight of water, and > 10% of an aldehyde, particularly formaldehyde, is heated at < 140°C. on a rotary drum while being pressed into a thin layer, which is simultaneously dried. The product is water-soluble, and a solution forms water-insoluble layers when dried on a substrate in presence of a catalyst.

B.P. 632,789.

A mixture of starch, a small proportion of water, and an aldehyde capable of forming insoluble condensation products with the starch, preferably formaldehyde, is heated in a neutral or alkaline medium on a rotary drum to remove the water and gelatinise the starch, which is pressed into a thin layer and dried. The product is water-soluble, and when heated in presence of a catalyst, e.g. dilute acetic acid, it forms insoluble layers; it may be utilised as a washproof finishing size for cotton fabric.

B.P. 632,791.

A mixture of starch or a high-mol.wt. starch derivative, a small proportion of water, an aminotriazine having at least 2 reactive H atoms, and an aldehyde capable of forming a synthetic resin with the aminotriazine is heated at pH not < 6 on a rotary drum to gelatinise the starch, pressed into thin layers, dried, and powdered. A cold-swelling starch is produced which is very soluble in cold water.

B.P. 633,342.

A cold-swelling starch degradation product is mixed in absence of water with an aminotriazine having at least 2 reactive H atoms and an aldehyde capable of forming a resin with the aminotriazine. The water-soluble product becomes water-insoluble on heating in presence of phosphoric acid or other catalyst and is useful for producing wash-resistant finishes on textile materials.

J. W. B.

Starch Conversion Process. H. R. Blattmann, A. H. Blattmann, and M. H. Tesdorpf. B.P. 633,003.

Starch is converted into glucose-containing products by heating and stirring a moist mass of acidulated starch solids in an autoclave, e.g. by raising to 100°C. at 2 atm., injecting superheated steam to raise to 130°C. at 3 atm., and maintaining at this temperature till the desired products are obtained.

J. W. B.

Phenol-Phenol Ether Condensates—Wetting Agents. Harvel Corp. B.P. 627,919.

The product obtained by condensing an alkyl ether of a phenol having an unsat. hydrocarbon substituent, e.g. eugenol, with a phenol containing no unsat. hydrocarbon substituent, e.g. phenol or naphthol, in presence of a cationoid condensing agent, e.g. sulphuric acid, is a good wetting agent when sulphonated.

B.P. 627,920.

The cationoid condensing agent is also a sulphonating agent and is used in such amount and/or concentration that it acts in both capacities simultaneously.

C. O. C.

Detergent. D. R. Byerly and Procter & Gamble Co. U.S.P. 2,486,921.

A mixture of 1 part by weight of a water-soluble alkali-metal salt of an organic sulphuric reaction product containing a C_{12-18} alkyl radical and a sulphonic or sulphuric ester radical and 2-5 parts of sodium tripolyphosphate has balanced sudsing and detergent power, heavy-duty cleansing performance, and is resistant to hardness during washing and rinsing.

C. O. C.

Detergent. B. Strain and Procter & Gamble Co. U.S.P. 2,486,922.

A mixture of 1 part by weight of a water-soluble salt of a compound containing a C_{12-18} alkyl radical and a sulphonic or sulphuric ester group, 1-5 parts by weight of a mixture of 90-95% of normal sodium tripolyphosphate and 10-35% of the thermal decomposition products of sodium tripolyphosphate, and enough of an alkali to give to an aqueous solution of the mixture pH 8.8-10.7, has excellent resistance to hard water.

C. O. C.

Urea-Formaldehyde Condensates having Detergent Properties. L. H. Bock, J. L. Rainey, and Röhm & Haas Co. U.S.P. 2,486,459.

A condensate of 1 mol. of urea, 1.75-3.0 mol. of formaldehyde, and 0.8 mol. of a sat. unsubst. C_{12-18} aliphatic alcohol is heated with 0.15-0.5 mol. of a water-soluble metal sulphite. The product has outstanding detergent properties in water containing much hardness or salt. Such products are not micellar but form macromolecules, which do not revert to simple molecules as do micelles. Thus they are excellent detergents at very low concentrations or at very high temperatures.

C. O. C.

Scrooping Compositions. S. Kaplan and Onyx Oil & Chemical Co. U.S.P. 2,482,917.

Butoxyethyl stearate dispersed in an aqueous solution of a film-forming organic colloid, e.g. gelatin or casein-

aluminium formate complex, is used to impart scroop to rayon and silk. C. O. C.

Colloidal Melamine-Urea-Formaldehyde Copolymer Solutions. H. P. Wohnsiedler, W. M. Thomas, and American Cyanamid Co. U.S.P. 2,485,079.

Colloidal aqueous solutions of melamine-urea-formaldehyde resin precondensates in which the dispersed particles are positively charged, and in which the precondensate is partly polymerised and so can be quickly and completely cured after drying, contain 1-70 mol. % of urea and 99-30 mol. % of melamine and 1-4 mol. of combined formaldehyde for each mol. of melamine + urea. The solution is brought to pH 0.25-4.0 by adding 0.2-2.5 mol. of HCl for each mol. of melamine. C. O. C.

Fungicides. W. D. Stewart, J. H. Standen, and B. F. Goodrich Co. U.S.P. 2,485,330.

Compounds of formula $R-S-C_nH_{2n}O-C_nH_{2n}Hal$ ($R =$ thiazyl; $n = 2-4$) are used in solution or dispersion as fungicides for textiles, leather, paper, etc. C. O. C.

Wrinkle Coating Composition. W. A. Waldie and New Wrinkle Inc. U.S.P. 2,486,232.

A composition, yielding wrinkle coatings of great durability and very uniform wrinkle-textured surface and suitable for application to fabrics, is obtained by mixing 1-10 parts by volume of a solution containing 0.5-1 lb. of polyvinylbutyl resin per gal. (U.S.A.) of solvent with 1 part by volume of a glyceride of a conjugated double-bonded oil fatty acid in which 1-2 of the OH groups of the glycerol are bonded to acid radical. C. O. C.

Hydrolysed Interpolymer of Allylidene Diacetate and Vinyl Acetate. E. F. Izard and Du Pont. (VI, p. 303.)

Some Further Uses of Maleic Anhydride in the Preparation of Synthetic Resinous Polymers. R. S. Robinson. (XIII, p. 307.)

Destruction of Organic Matter by Acid Ashing, with particular reference to the Use of Perchloric Acid in the Oxidation of Textile Materials. A. G. Hamlin. (XIV, p. 308.)

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Studies in Light Absorption. IX—Relation between Absorption Intensities and Molecular Dimensions, and its Application to the Electronic Spectra of Polyenes and Polycyclic Benzenoid Hydrocarbons. E. A. Braude. *J.C.S.*, 379-384 (Jan. 1950).

A theory of absorption intensities based solely on considerations of molecular geometry is proposed, whereby it is possible to calculate, in a very simple manner, the maximum possible extinction coefficient of a molecule, the only assumption made being that the light must fall within the space of the molecular dimensions in order to be absorbed. The calculation is independent of the nature of the transition or the frequency of the light. The present treatment leads to the same general result as the classical one. The actual extinction coefficients for allowed transitions can be calculated from considerations of the effective "chromophore area" and the polarisation direction of the light absorbed. The values thus obtained for polyenes and polycyclic benzenoid hydrocarbons are in good agreement with those observed. H. H. H.

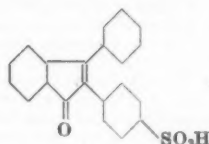
Electrolytic Preparation of Azo Dyes. III—Dye Formation at an Iron Anode. M. V. Sitaraman and V. V. Raman. *Current Sci. (India)*, 18, 291, 292 (1949); *Chem. Abs.*, 44, 462 (25th Jan. 1950).

Substituting an iron anode for platinum decreases both cost and the tendency for anodic oxidation of nitrites to nitrates in anolytes of low alkalinity. Yields were comparable to those obtained with platinum. Treatment of sheet iron before use includes rounding off corners, cleaning, heating to redness, and chilling. The thin oxide layer formed may help passivation of the anode. Preparation of the following dyes is described—Roccelline in 29.6% yield, but this may be increased to 61.4% by trebling the time of passage of current. Ponceau G in 20.3% yield, increased to 60.2% as above. Ponceau 2R forms only in

alkaline medium; however, presence of $NaNO_3$ improves the yield to 95.5% by continuation of the process to six times the theoretical duration. C. O. C.

Indonesulphonic Acids—Dyes for Wool. D. Ivanov and C. Ivanov. *Compt. rend.*, 227, 1379-1381 (1948); *Chem. Abs.*, 44, 134 (10th Jan. 1950).

When an aryl-substituted 3-hydroxypropionic acid carrying a phenyl group in the 2-position is treated with a mixture of H_2SO_4 and oleum, an indonesulphonic acid is obtained. Thus when $(C_6H_5)_2C(OH)-CH(C_6H_5)-COOH$ in H_2SO_4 is poured into water it forms orange-red oil—



Treatment with NaCl or NaOH gives the Na salt, orange crystals, m.p. 278-280°C. This acid and that formed by 2-phenyl-3:3-di-p-tolyl-3-hydroxypropionic acid dye wool. C. O. C.

Ratio of Sodium Sulphide, Sulphur, and Dinitrochlorobenzene in making Sulphur Black. Ke-Chung Chang and Ke-Kang Hua. *J. Chem. Eng. China*, 16, 18-24 (1949); *Chem. Abs.*, 44, 333 (10th Jan. 1950).

The colour value and yield of Sulphur Black is influenced by the proportions of Na_2S , S, and $Cl-C_6H_4(NO_2)_2$ used in its manufacture. If the "value" of the dye is defined as its yield (in manufacture) multiplied by the colour value of its dyeings, then a maximum value is obtained when Na_2S and S are used in a ratio corresponding to the formula Na_2S_4 and when equal weights of Na_2S and $Cl-C_6H_4(NO_2)_2$ are used. C. O. C.

Grey Vat Dye from the Spent Lye from making Indanthren Blue. W. Wittenberger. *Österr. Chem.-Ztg.*, 50, 58, 59 (1949); *Chem. Abs.*, 44, 332 (10th Jan. 1950).

The spent lye contains reduced "Indanthren B", of unknown composition, which is precipitated by air oxidation. This precipitate is dissolved in conc. H_2SO_4 , treated with glycerol and a reducing agent (Fe or Al), and poured into water; the product which separates is fused with 85% KOH, cooled by pouring into ice water, and then oxidised by bubbling air through. The product is soluble in conc. H_2SO_4 and dyes cotton a fast grey from a brown vat. C. O. C.

3-Azabenzanthrone Dyes. C. F. H. Allen, J. V. Crawford, R. H. Sprague, E. R. Webster, and C. V. Wilson. *J. Amer. Chem. Soc.*, 72, 585-589 (Jan. 1950).

The preparation of a large number of variously substituted 3-azabenzanthrone dyes is described, and their absorptions are recorded. They include 1-arylamino derivatives, which have not hitherto been prepared; they are not particularly fast to light. C. O. C.

Cyanine Dyes. I—[Ogata's] neoCyanine and its By-product. II—Reaction between Aromatic Primary Amines and Ethyl Orthoformate. Y. Mizuno and M. Nishimura. *J. Pharm. Soc. Japan*, 68, 54-57 (1948).

Fluorescence of Cyanine and Related Dyes in the Monomeric State. L. J. E. Hofer, R. J. Grabenstetter, and E. O. Wiig. *J. Amer. Chem. Soc.*, 72, 203-209 (Jan. 1950).

Examination of the fluorescence of very dilute solutions of a considerable number of various cyanine and related dyes shows that solvents of widely varying dielectric constants have less effect on the fluorescence spectrum than they have on the absorption spectrum. There is a strong tendency for the first members of vinylene homologous series of dyes to be non-fluorescent, this tendency being due to a steric effect and to the electronic energy of the excited dye molecule being converted to vibrational energy, which is dissipated as heat or infra-red radiation; this conversion of energy is an aspect of Lewis and Calvin's "loose bolt" theory (*Chem. Rev.*, 25, 273 (1939)). C. O. C.

Theoretical Interpretation of the Light Absorption of Organic Dyes. H. Kuhn. *Z. Elektrochem.*, **53**, 165-178 (1949); *Chem. Abs.*, **44**, 433 (25th Jan. 1950). The equation—

$$\lambda = \frac{8\pi mcL^2}{h(n+1)}$$

for the first absorption band of a dye (*Chem. Abs.*, **43**, 1653 (1948)) is reviewed and shown to give results agreeing well with the experimental data for symmetrical polymethins (cyanine and oxanole dyes, Michler's Hydrol Blue and derivatives, Malachite Green and other triphenylmethane dyes), and to be applicable to the porphyrins and phthalocyanines. For the polyenes (carotenoids, unsymmetrical cyanines and oxanoles, merocyanines, and many azo and stilbene dyes), the electrons can no longer be considered as a free electron gas; they are treated as electrons in a one-dimensional potential field with a sinusoidal periodicity, and the wavelength calculated from—

$$\lambda_1 = 1 / \left(\frac{V_0 \left(1 - \frac{1}{n}\right)}{hc} + \frac{h(n+1)}{8\pi mcL^2} \right)$$

(V_0 = amplitude of the potential change which a π electron undergoes along the chain, n = number of π electrons, h = Planck's constant, c = velocity of light, m = mass of an electron, L = length of the chain) is confirmed by experience. This explains the fact that the position of the absorption bands of polyenes and similar compounds depends in various ways on the length of the chain, and gives a simple explanation to the classical theory of colour.

C. O. C.

Nature of Thermochromism. W. T. Grubb and G. B. Kistiakowsky. *J. Amer. Chem. Soc.*, **72**, 419-425 (Jan. 1950).

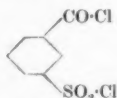
The thermochromism of diphenylmethylenanthrone and dianisylmethylenanthrone is due to a trivial cause, the broadening of a near-ultraviolet absorption region by changing distribution of molecules among vibrational states. The thermochromism of dianthrone and dianthrone-2:2'-dicarboxylic acid is due to the existence of a distinct electronic level situated 3.5 kg. cal. above the ground state, which is probably a triplet (diradical) state of the molecules.

C. O. C.

PATENTS

Colour Couplers. A. Weissberger, I. F. Salminen, and Eastman Kodak Co. *U.S.P.* 2,484,477.

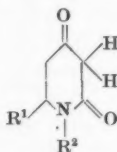
Colour couplers are prepared by joining two different primary or secondary amines, one or both of which may be couplers, or one of which may be a heterocyclic compound containing a reactive mercapto or imino group, or one of which may be a non-coupling aliphatic or aromatic amine, by means of a two-step condensation involving sulphobenzoyl dichloride—



C. O. C.

Pyridone Couplers in Diazotype Printing. General Aniline & Film Corp. and J. F. Morgan. *B.P.* 633,877.

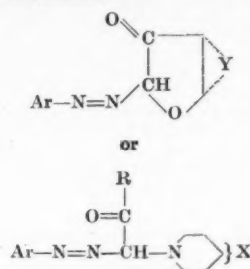
Purple prints are obtained by using as the coupling component a compound of formula—



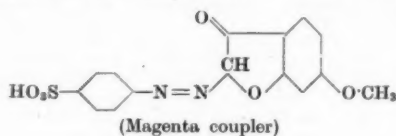
(R^1 = Alk or Ar, R^2 = aliphatic or aromatic radical) or a water-soluble salt thereof, e.g. 6-methylpyridine-2:4-diol (R^2 = H).

C. O. C.

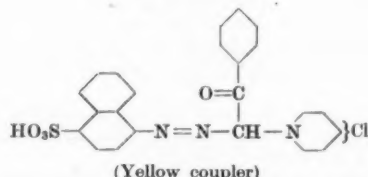
Photographic Colour Formers. General Aniline & Film Corp. and N. Heimbach, *B.P.* 633,823. Compounds of formula—



(R = alkyl or aryl, X = an anion, Y = atoms necessary to complete an aryl nucleus), e.g.—



(Magenta coupler)

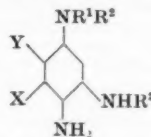


(Yellow coupler)

are used as colour formers when developing a latent silver image with an aromatic amine developer. Their azo group is displaced by the arylamino group during dye image formation.

C. O. C.

Phenazonium Dye Images. W. A. Schmidt, V. Tulagin, and General Aniline & Film Corp. *U.S.P.* 2,486,440. Aromatic triamines of general formula—



(R^1 = H or Alk; R^2 = H, Alk, or Ar; R^3 = an aromatic radical one of whose ring C atoms is directly linked to the N, or an aliphatic radical one of whose C atoms is directly linked to the N, and in such case is joined to not < 2 H atoms; X and Y = H, sulpho or carboxy, or together = atoms necessary to complete a six-membered isocyclic ring) are used as photographic colour developers. Thus 3-stearoylamino-5-sulpho-acetoacetanilide developed with 2:4-bisphenylaminoaniline gives a magenta image.

C. O. C.

Azine Dye Images. General Aniline & Film Corp., J. A. Sprung, and W. A. Schmidt. *B.P.* 633,760.

Azine dye images, more stable than quinoneimine and azomethine dye images, are made by colour-forming development while using conventional primary aromatic amine developers if aromatic compounds having a benzene ring containing in the 1-position a primary, secondary, or tertiary amino group, and in the 3-position a secondary amino group substituted on the N atom with a group which is more electronegative than hydrogen, are used as the colour formers.

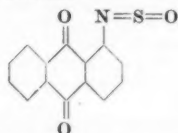
C. O. C.

1-Dicarbalkoxymethylene-2-alkyl-1:2-dihydroisoquinolines and Quaternary 1-Methyl-2-alkylisoquinolinium Salts and their use as Intermediates for Carboaniline and other Methin Dyes. Kodak Ltd., F. L. White, and L. G. S. Brooker. *B.P.* 633,873, *B.P.* 633,874.

B.P. 633,874.

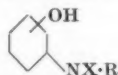
1-Aminoanthraquinone—Purification by Conversion to the Sulphinylamino Derivative. H. Z. Lecher, D. R. Eberhart, and American Cyanamid Co. U.S.P. 2,479,943.

Crude 1-aminoanthraquinone is refluxed with thionyl chloride in a low-boiling solvent, e.g. carbon tetrachloride. After decolorising with activated carbon and cooling the 1-sulphinylamino derivative—



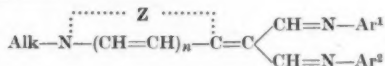
is filtered off. Hydrolysis back to the 1-amino compound occurs during removal of the solvent by steam-distilling. R. K. F.

Diazotype Compositions containing N-Acylamino-phenol Couplers. W. H. von Glahn, L. N. Stanley, and General Aniline & Film Corp. U.S.P. 2,485,122. Sepia prints are obtained by using, as the azo component, a compound of formula—



(R = benzoyl or benzenesulphonyl, X = H or an aliphatic or araliphatic radical), e.g. 3-(N-3'-aminobenzoyl)aminophenol. C. O. C.

Dianiloisopropylidene Intermediates for Polymethine Dyes. F. M. Hamer, R. J. Rathbone, B. S. Winton, and Eastman Kodak Co. U.S.P. 2,484,503. Compounds of formula—



(n = 0 or 1, Z = non-metallic atoms necessary to complete a 5- or 6-membered heterocyclic nucleus) are useful intermediates for producing polymethine dyes. C. O. C.

Oxazolone Derivatives—Intermediates for Cyanine Dyes. J. D. Kendall, G. F. Duffin, and Ilford Ltd. B.P. 633,736.

A higher homologue of an orthoformic ester is treated in presence of an organic acid anhydride with an N-acylglycine in which the acyl group is the residue of an aromatic carboxylic acid. C. O. C.

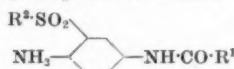
Basic Dye Derivatives for Photographic Antihalation Layers. Gevaert Photo-Producten N.V. B.P. 633,622.

A basic dye containing a >C=N- group forming part of a heterocyclic ring condensed with an organic acid containing at least one salt-forming carboxyl group is used in photographic antihalation layers. C. O. C.

3-Pentadecylphenol as a Component for Azo Dyes or Intermediates. Harvel Corp. B.P. 627,918.

Coupling 3-pentadecylphenol or hydrogenated cardanol with a diazotised aromatic amine yields a dye; e.g. a red dye is obtained with bisdiazotised dianisidine. Such products can be reduced to yield 4-amino-3-pentadecylphenol, which can be diazotised and coupled to yield an azo dye; thus a yellow-orange dye is obtained by diazotising 4-amino-3-pentadecylphenol and then coupling with 3-pentadecylphenol. C. O. C.

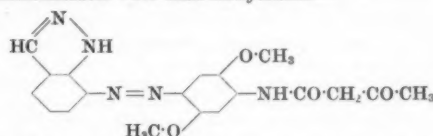
Monoazo Acid Dyes. Ciba Ltd. B.P. 632,699. Acid dyes are made by coupling a diazotised 2-amino-5-acylaminoindiphenyl sulphone of formula—



(R¹ and R² = radicals of the benzene series) with a 2-alkylamino-8-naphthol-6-sulphonic acid. Thus 2-amino-5-benzoylamino-4'-methylidiphenyl sulphone is diazotised in nitrosylsulphuric acid, and the diazo compound, after isolation, coupled in presence of acetic acid with 2-methylamino-8-naphthol-6-sulphonic acid to yield a reddish-violet wool dye. E. S.

Azoic Dyes. S. A. de Matières Colorantes et Produits Chimiques Francolor. B.P. 632,595.

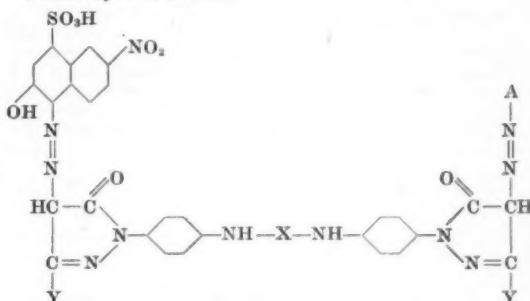
Azoic dyes made by coupling a diazo compound on the fibre with an acylacetyl derivative of an aminoazo or diaminoazo dye have satisfactory fastness if the final dye molecule contains one or more indazole, benzimidazole, or benztriazole nuclei, as such dyes can combine with metals (especially copper) in an aftertreatment process. Thus the acetoacetyl derivative of the monoazo compound 7-aminoindazole→2:5-dimethoxyaniline—



is applied to cotton and developed with diazotised p-nitroaniline. Aftertreatment with aqueous copper sulphate containing ethanalamine gives a brownish black. E. S.

Metallisable, Substantive, Disazo Dyes. J. R. Geigy A.-G. B.P. 632,944.

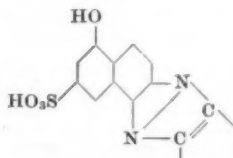
Disazo dyes of formula—



(X = CO or CS; Y = alkyl, phenyl, carboxyl, carbalkoxy, or carbamyl; A = the radical of an aromatic amine free from azo groups, other than 6-nitro-1-amino-2-naphthol-4-sulphonic acid) may be metallised (especially with copper salts) in substance or on the fibre. Thus 1 mol. of the monoazo dye 6-nitro-1-amino-2-naphthol-4-sulphonic acid→ethyl 1-p-aminophenyl-5-pyrazolone-3-carboxylate is condensed with 1 mol. of the monoazo dye 1-amino-2-naphthol-4:6-disulphonic acid→ethyl 1-p-aminophenyl-5-pyrazolone-3-carboxylate by means of phosgene, to yield a disazo dye giving red-brown on cotton, converted to red by aftercoppering. E. S.

Substantive, Disazo Dyes containing Copper. Sandoz Ltd. B.P. 633,206.

Disazo dyes which may be converted into copper complexes in substance or on the fibre are made by coupling a tetrazotised 3:3'-dialkoxy-4:4'-diaminodiphenyl with 1 mol. of a naphtholsulphonic acid and 1 mol. of an azine of formula—



(>C=C< is a portion of an aryl residue). Thus dianisidine is tetrazotised and coupled with 1 mol. of 1-naphthol-4:8-disulphonic acid and then with 1 mol. of 2'-sulpho-4'-hydroxy-2:3-benzophenazine in presence of 5-10% of pyridine bases, and the product refluxed with ammoniacal copper sulphate. The alkoxy groups are thereby removed either completely or to a substantial extent, and the copper complex so formed dyes cellulose fibres blue-gray. E. S.

Red Disazo Pigment for Rubber and Plastics. J. Glassman, D. T. Sarfas, and I.C.I. Ltd. B.P. 633,215.

By tetrazotising a mixture of 3:3'-dichlorobenzidine and o-dianisidine, in which the molecular proportion of the latter is 25-95%, and coupling in dilute acid medium with

2 mol. of 1-*p*-tolyl-3-methyl-5-pyrazolone, red pigments for rubber and synthetic resins are produced, giving bluer and brighter hues than those obtained by dry mixing of the two separately prepared, homogeneous pigments.

E. S.

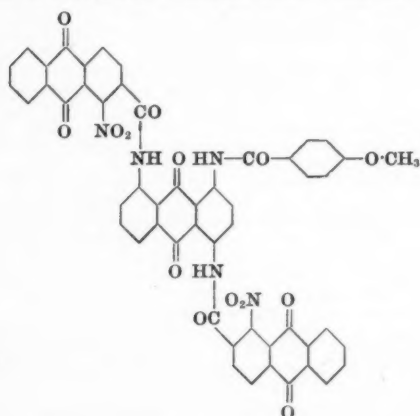
Substantive, Copperable, Polyazo Dyes. J. R. Geigy A.-G. B.P. 633,166.

Modification of B.P. 579,063 (cf. J.S.D.C., 63, 122 (1947)). A tetrazotised 3:3'-dialkoxy-4:4'-diaminodiphenyl is coupled with 1 mol. of a monoazo compound *o*-carboxyamine $\xrightarrow{\text{Acid}}$ 2-amino-5-naphthol-7-sulphonic acid, and with 1 mol. of a monoazo compound A $\xrightarrow{\text{Acid}}$ 2-amino-5-naphthol-7-sulphonic acid, where A is an amine not containing an *o*-carboxy group. The products dye cellulose fibres blues, greys, and blacks, which may be aftercoppered. Thus tetrazotised dianisidine is coupled first with 1 mol. of the monoazo compound 5-nitroanthranilic acid $\xrightarrow{\text{Acid}}$ 2-amino-5-naphthol-7-sulphonic acid, and then with 1 mol. of the monoazo compound 3-amino-5-sulphosalicylic acid $\xrightarrow{\text{Acid}}$ 2-amino-5-naphthol-7-sulphonic acid to yield a navy blue substantive, tetrakisazo dye, suitable for aftercoppering.

E. S.

Anthraquinonoid Vat Dyes. A. Livingston and I.C.I. Ltd. B.P. 631,213.

Red to violet vat dyes are obtained by treating a 4:8-diamino-1-arylaminoanthraquinone with at least 2 mol. proportions of an acylating derivative of an anthraquinone-2-carboxylic acid having in the 1-position an amino or nitro group or halogen atom. Thus the dye—

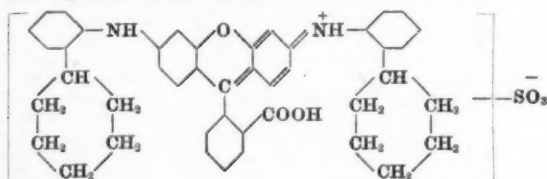


is prepared by heating 4:8-diamino-1-*p*-methoxybenzoylaminoanthraquinone and 1-nitroanthraquinone-2-carboxylic chloride in *o*-dichlorobenzene for 1 hr. at 170–178°C. The product is separated after cooling by filtering and washing with benzene.

R. K. F.

Sulphonated Xanthen Derivatives—Wool Dyes. H. France, N. H. Haddock, and I.C.I. Ltd. B.P. 631,039.

Red to violet wool dyes, faster to wet treatments than conventional xanthen dyes, are made by sulphonating 3:6-dianilinofluorans containing in the anilino groups cyclohexyl groups *ortho* and/or *para* to the N atoms. Thus 3:6-bis-*o*-cyclohexylanilinofluoran, made by heating a mixture of anhyd. ZnCl_2 , 3:6-dichlorofluoran, powdered lime, and *o*-cyclohexylaniline at 100°C. for 2 hr., is stirred with sulphuric acid at 20°C. till a test is soluble in aqueous ammonia. After separating by pouring on to ice and filtering there results the dye—



H. France and I.C.I. Ltd.

B.P. 631,040.

3:6-Bisalkylanilinofluorans, in which the alkyl(s) are *ortho* or *para* to the N atoms, when sulphonated so as to introduce only two sulfo groups per mol., are faster to light than corresponding derivatives containing either more or fewer sulfo groups per mol. Thus the basic dye obtained by condensing 3:6-dichlorofluoran with 2 mol. of *m*-4-xylydine is stirred with 100% sulphuric acid at 10–15°C. till a test is soluble in cold 2% aqueous ammonia. 20% Oleum is then run in at 5–7°C. until a test is soluble in water but not wholly soluble in 2% aqueous sodium chloride. The resulting dye is separated by pouring on to ice, and purified by acidifying a solution of the product in aqueous ammonia.

R. K. F.

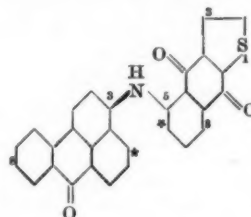
2:4-Dinitrophenylaminobenzanthrones—Vat Dyes. W. Schmidt-Nickels and General Aniline & Film Corp'n. U.S.P. 2,481,449.

An aminobenzanthrone is heated for 5 hr. at 230–240°C. with excess of 1-chloro-2:4-dinitrobenzene to give a blue-grey vat dye fast to chlorine.

R. K. F.

Benzanthranylaminothiophanthraquinone Compounds and Derivatives—Vat Dyes and Intermediates. C. F. Belcher, L. A. Mero, and Du Pont. U.S.P. 2,480,109.

Vat dye intermediates are made by condensing a 5- or 8-aminothiophanthraquinone with a 3-bromobenzanthrone, which may also carry bromine in the 8-position; alternatively a 5- or 8-bromothiophanthraquinone and a 3-aminobenzanthrone may be used. Thus 3-bromobenzanthrone, 5-aminothiophanthraquinone, sodium carbonate, and cuprous chloride when heated together for 8 hr. at 200–205°C. in nitrobenzene yield the product—



U.S.P. 2,480,110.

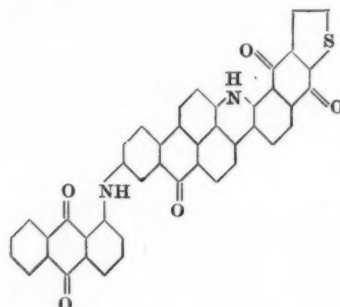
The above compounds are cyclised between the asterisked (*) points by heating in methyl alcoholic potassium hydroxide at 145°C. to give the corresponding acridines, which are olive to grey vat dyes.

U.S.P. 2,480,111.

3:8-Dibromo(or diamino)benzanthrone are condensed with 2 mol. proportions of 5- or 8-amino(or bromo)thiophanthraquinones to give vat dye intermediates; alternatively one of the mol. proportions of the thiophanthraquinone may be replaced by a 1-amino(or bromo)anthraquinone.

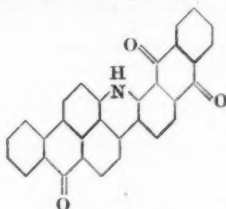
U.S.P. 2,480,112.

The compounds of U.S.P. 2,480,111 (see above) are cyclised to yield olive to grey vat dyes. Thus 3-(5'-thiophanthraquinonylamino) - 8 - (1'' - anthraquinonyl - amino)benzanthrone is heated at 150–160°C. with a sodium hydroxide melt containing β -methoxymethoxyethanol to give the vat dye—



R. K. F.

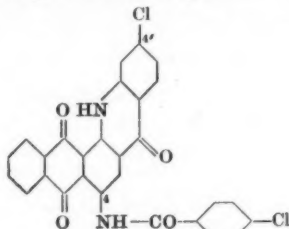
Purification of Vat Dyes. M. Scalera and American Cyanamid Co. U.S.P. 2,483,238.
Dyes containing the ring system—



are purified by salting out the sodium salts of their leuco derivatives from alkaline hydrosulphite solution. Thus the dye resulting from the alcoholic potash fusion of crude 1-(3'-benzanthronylamino)anthraquinone is vatted with caustic soda and sodium hydrosulphite. Salt solution is added at 70°C., and the whole cooled and filtered. The product is suspended in water and aerated. R. K. F.

Anthraquinone-Acrinone Vat Dyes. General Aniline & Film Corp., L. D. Barrick, and P. Nawiasky. B.P. 633,132.

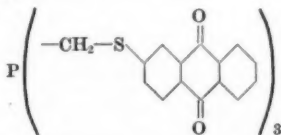
A 4'-halogeno-4-aminoanthraquinone-2:1-benzacridone is treated with a *para*-substituted benzoyl chloride to give blue vat dyes. Thus the dye—



is obtained by heating equimol. amounts of 4'-chloro-4-aminoanthraquinone-2:1-benzacridone and *p*-chloro-benzoyl chloride at 110–130°C. until a test portion shows no green colour in boric acid-acetic anhydride solution. R. K. F.

Sulphuric Esters of Leuco Phthalocyanine Vat Dyes. N. H. Haddock, W. O. Jones, J. K. Page, D. G. Wilkinson, and I.C.I. Ltd. B.P. 633,478.

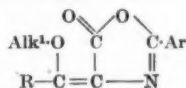
Vat dyes of general formula P(AV)_x (P = phthalocyanine residue; A = a linking group, e.g. -CO-; V = residue of a vatable compound; x = 1–4) are treated in the form of their leuco derivatives (or the vat dye itself in presence of a metal may be used) with sulphur trioxide or an addition compound of sulphur trioxide and an organic amide or tertiary base, in presence of an organic base. Thus the dye—



(P = copper phthalocyanine residue) is heated at 75–80°C. for 4 hr. with copper powder, sodium pyrosulphate, and pyridine. The leuco sulphuric ester is isolated by adding the product to aqueous sodium hydroxide, distilling off the pyridine, and salting. R. K. F.

Methin Dyes. J. D. Kendal, G. F. Duffin, and Ilford Ltd. B.P. 633,735.

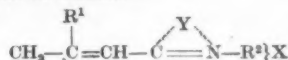
A compound of formula—



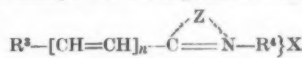
(R = H or Alk²) is treated with a compound containing a reactive methylene group. C. O. C.

β-Substituted Polymethin Dyes. Gevaert Photo-Producten N.V. B.P. 633,824.

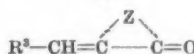
A substance of formula—



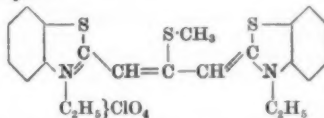
(R¹ = Alk-S, Alk-Se, Alk-O (the alkyl may be subst. or unsubst.), Ar-S, Ar-Se, Ar-O, or the S may be linked to a heterocyclic nucleus; R² = alkyl, aralkyl, or aryl; X = an acid radical; Y = molecular residue required to complete a five-membered heterocyclic ring, which may be fused to an aromatic ring (instead of the usual quaternation either a subst. or unsubst. trimethylene bridge may exist between the N and the *peri* C atom of Y)) is treated with a compound which reacts with the CH₂ group, e.g. an aromatic aldehyde, or a compound of formula—



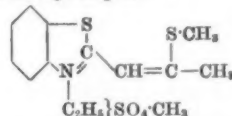
or



(R³ = a group which reacts with the methyl group, Z = non-metallic atoms necessary to complete a 5- or 6-membered heterocyclic ring, and n = 0 or a whole number). Thus the dye—



crystallises out when 1-ethyl-2-(2'-methylthiopropenyl)-benzthiazolium methyl sulphate—



is boiled in pyridine with 1-ethyl-2-methylthiobenzthiazolium *p*-toluenesulphonate in presence of triethylamine and then treated with aqueous sodium perchlorate. C. O. C.

Photographic Sensitising Cyanine Dyes from α-Methyl-9:10-phenanthroxazole. Du Pont. B.P. 633,158.

meso-Substituted Carbocyanine Dyes and Thio-ketones. G. H. Keyes and Eastman Kodak Co. U.S.P. 2,486,173.

A *meso*-substituted carbocyanine dye and a thio-ketone are simultaneously prepared by condensing a quaternary salt of a heterocyclic N base containing in α or β position a CH₂ or Alk-CH₂ group with an ester of a dithiocarboxylic acid. The dye is then separated from the thio-ketone, which can be used as an intermediate for cyanine dyes. C. O. C.

Non-dusting, Water-soluble Organic Dye. J. M. Iamarino and Allied Chemical & Dye Corp. U.S.P. 2,486,562.

Organic dyes can be obtained as non-dusting powders by mixing them with not > 6% of their weight of a liquid dialkyl ester of a phthalic acid having not > 4 C atoms in each alkyl group, e.g. dimethyl phthalate. C. O. C.

Carotene Concentrate. W. Lange, R. G. Folzenlogen, and Procter & Gamble Co. U.S.P. 2,484,040.

A process for the continuous extraction of carotene from palm oil. C. O. C.

Carbon Black. Godfrey L. Cabot Inc. B.P. 633,945.

A process is described for making furnace blacks having a wide range of characteristics and properties and of colour range from that of the darkest channel rubber blacks to that of the greyest medium thermal blacks. C. O. C.

Basic Lead Phosphite Pigments. L. M. Kebrich and National Lead Co. U.S.P. 2,483,469.

Dibasic lead phosphite 2PbO.PbHPO₃.3H₂O is, in the form of fine acicular crystals, of good white colour and has high tinting strength and covering power. C. O. C.

Rutile Titanium Dioxide. L. C. Copeland, C. W. Farber, and New Jersey Zinc Co. *U.S.P.* 2,486,465.
Printing with Dyes containing Quaternary or Ternary Salt Groups. T. Chadderton, R. Thornton, and I.C.I. Ltd. (IX, p. 304.)

V—PAINTS; ENAMELS; INKS

PATENTS

Black Surface Conversion Coatings on Zinc. J. E. Stareck and United Chromium Inc. *U.S.P.* 2,483,510.

A dip composition for producing black surface conversion coatings on zinc consists of an aqueous solution at pH 0.8–2.5 containing chromium sulphate and/or fluoride and a soluble silver salt.

Synthetic Resins for use in Moisture-setting Printing Inks. W. D. Jones and Hercules Powder Co.

U.S.P. 2,483,468.

Phenol, formaldehyde, and a liquid rosinate of a mono-hydric alcohol are heated in presence of an acid condensation catalyst so as to cause an exothermic reaction to occur. When all the formaldehyde has combined with the other components the condensate is dehydrated by heating until a hard resin is obtained. Moisture-setting printing inks containing such resins set immediately on application of water or steam. No action occurs between the resin and normally reactive pigments, so that the inks remain homogeneous and do not increase in viscosity with age.

C. O. C.

Siloxane Resins—Paint Vehicles. Dow Corning Corp. and E. J. Smith.

B.P. 633,850.

Siloxane resins which are non-tacky after removal of solvent and are suitable for use in paints and enamels are prepared by hydrolysing a mixture of compounds of formulae $\text{CH}_3\text{-SiX}_3$ (15–40 mol. %), $\text{C}_6\text{H}_5\text{-SiX}_3$ (25–55 mol. %), and $\text{C}_6\text{H}_5\text{-Si}(\text{CH}_3)\text{X}_2$ (30–50 mol. %) (X = Hal or O-Alk). The coatings may be cured by heating, e.g. for 4 hr. at 140°C.

E. C.

Wrinkle Coating Composition. W. A. Waldie and New Wrinkle Inc. (III, p. 297.)

VI—FIBRES; YARNS; FABRICS

Effect of Variations in Degree of Structural Order on some Physical Properties of Cellulose and Cellulose Acetate Yarns. R. W. Work. *Text. Research J.*, 19, 381–393 (July 1949).

Experiments are described in which cellulose acetate fibres of differing degrees of orientation produced by drawing are saponified into cellulose fibres, and the changes in degree of orientation and crystallisation are examined by X-ray and other techniques. Acetylation of native cellulose to the triacetate modifies the original cellulose unit cell somewhat, and the X-ray data show there is some crystalline but much amorphous material present. When the triacetate is partly hydrolysed to the secondary cellulose acetate used for making acetate rayon, a marked change in structural order with decrease in crystallinity occurs. Dry-stretching or swelling and stretching such a fibre causes a marked increase in tenacity and reduction in extensibility, owing to an increase in degree of orientation. There is little change in crystallinity. When, however, these oriented acetate fibres are saponified, the resulting cellulose fibres show a pronounced increase in crystallinity and in tensile strength. Coupled with the increase in longitudinal strength there is a decrease in lateral strength. It is also shown that both orientation and crystallinity affect Young's modulus of elasticity. Dyeing tests indicate that the difference between a normal and an immature cotton may be partly one of orientation.

P. C.

Specificity of Microbiological Attack on Cellulose Derivatives. R. G. H. Siu, R. T. Darby, P. R. Burkholder, and E. S. Barghoorn. *Text. Research J.*, 19, 484–488 (Aug. 1949).

The attack of micro-organisms on glucose, mannose, cellobiose, and cellulose, and derivatives of these compounds, has been studied. Whereas the unsubstituted compounds supported growth, any substitution on the pyranose ring caused increased resistance to microbiological attack. Neither the nature nor the number of substituents determined the extent of resistance. However, the data suggested that complete resistance is exhibited

only when the degree of substitution is greater than one. In cellulose itself there is evidence that micro-organisms are capable of digesting unsubstituted anhydroglucose units at any position in the chain of a partly substituted cellulose derivative.

P. C.

Inner Membrane of Animal Fibres. H. Zahn. *Melliand Textilber.*, 31, 36–38 (Jan. 1950).

Recent research work on the morphology of animal hairs is discussed. The chemical constitution of the portions of the wool fibre which are insoluble in pancreatin is described, and methods are given for isolating preparations containing inner membranes which involve treatment of human hair at 10°, 40°, and 100°C. in caustic soda. The author maintains that the inner membrane exists between the outer scales and the spindle cell layer.

B. K.

Synthetic Fibres. H. V. Potter. *Chem. and Ind.*, 879–885 (17th Dec. 1949).

The development of regenerated fibres is described historically. Out of this arose a knowledge of fibre-forming requirements sufficient to build fibres entirely synthetically, and in 1932 Carothers published his well known development of polyamides. Since then many other fibre-forming polymers have been investigated. These include polyurethanes, polyvinyl chloride and acetate, polyethylene, etc., the ester polyethylene glycol terephthalate, and certain acrylonitriles. It is remarkable that these polymers, in many cases brittle solids, will give soft fibres on extrusion and subsequent orientation into a semi-crystalline fibre. The properties and uses of these fibres are discussed, and it is concluded that, although in specific properties they are individually superior to the natural fibres, the latter are at present of more general application.

W. J. M.

Synthetic Fibres from Natural Proteins—Reactions with Formaldehyde. D. Traill. *Chem. and Ind.*, 23–30 (14th Jan. 1950).

The importance of the tanning process in the production of satisfactory synthetic protein fibres is shown to be due to the relative bulkiness of the parent proteins. This bulkiness, caused by the presence of side-chains, results in loss of lateral cohesion, which, in the wool fibre, is improved by the cystine link. In the fibres under discussion the cohesion is improved by cross-linking the protein molecules with formaldehyde. The possible reactions of the formaldehyde with each of the reactive groups present in the protein chain are discussed, but it is concluded that even with all the evidence available there is no definite proof of what exactly happens. Under acid conditions it is probable that there is a methylene bridge between amide groups, and in alkali the amino groups are involved. Two comprehensive tables give the amino acid content and frequency of occurrence of individual side-chains in twenty proteins.

W. J. M.

Water Sorption by Synthetic High Polymers. M. Dole and I. L. Faller. *J. Amer. Chem. Soc.*, 72, 414–419 (Jan. 1950).

Water-sorption data at 25°C. are given for eleven synthetic linear polymers, including several polyamides and polyethylene terephthalate. The data are interpreted in the light of Brunauer, Emmett, and Teller's and other sorption theories. Sorption by the polyesters is so small that it probably occurs only on end-groups. Sorption by polyvinylpyrrolidone is so great that probably every peptide bond serves as a sorption site. Sorption by the polyamides is small and greatly affected by the extent of disorder in the solid. Polyvinylmethoxyacetals sorb water to a much larger extent than would be expected at high vapour pressures of the water, which may indicate that more sorption sites become available at higher R.H.

C. O. C.

Dynel—A New Synthetic Staple Fibre. Anon. *Canadian Textile J.*, 66, 51 (9th Dec. 1949); *Rayon Synthetic Text.*, 30, 74 (Dec. 1949).

Dynel is the new generic name for the new acrylonitrile-vinyl chloride staple fibre produced by Carbide & Carbon Chemicals Corp. This name specifically distinguishes it from the older Vinyon yarns. It has excellent general properties, and is non-combustible and chemically very inert, although it dyes well with many dyes of the acid type. The fibre does not absorb water. The usual systems for cotton, wool, worsted, and spun silk may be used for handling Dynel.

W. J. M.

Bonded Fabric Industry. R. B. Seymour. *Amer. Dyestuff Rep.*, 38, 453-454, 480 (13th June 1949).

A brief review is presented of the methods of production and uses of non-woven fabrics. Apart from their use in expendable items, they are of value in replacing woven fabrics in plastic laminates and as base material for such products as linoleum, etc. There are 62 references, mostly to patents. W. K. R.

PATENTS

Wet Processing of Viscose and Cuprammonium Rayon Mono- or Multi-filaments. American Bemberg Corpn. *B.P.* 633,108.

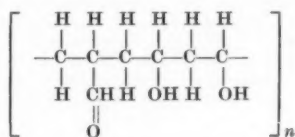
The freshly formed threads are drawn in open-width warp form through a bath or successive baths of treating liquid. They pass in a horizontal straight line into and through the liquid close to its upper surface and in such a manner that the speed of the threads and their distance from each other coact to cause the liquor to circulate. C. O. C.

Purifying Freshly Regenerated Viscose Rayon or the like. R. O. Denyes and Celanese Corpn. of America. *U.S.P.* 2,486,522.

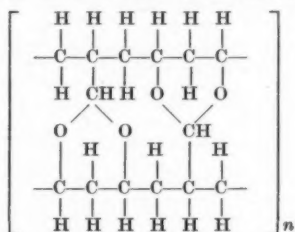
Freshly regenerated viscose rayon still containing adherent and occluded acid and salts is washed with ordinary tap water, then desulphurised with a dil. soln. of ammonium sulphide in demineralised water and rinsed in demineralised water. Ash tests show the product to have an extremely low mineral content. C. O. C.

Hydrolysed Interpolymer of Allylidene Diacetate and Vinyl Acetate. E. F. Izard and Du Pont. *U.S.P.* 2,485,239.

The products obtained by hydrolysing the interpolymer of allylidene diacetate and vinyl acetate have the following formula—



They are stable if not subject to heat and/or acid conditions. In acid medium they automatically cross-link with liberation of water to give insoluble infusible products of formula (cf. *J.S.D.C.*, 65, 88 (Feb. 1949))—



They have low softening points, are soluble in many solvents, and are readily wet- or dry-spun into filaments. Many of the non-crosslinked polymers are water-soluble, can replace regenerated cellulose or polyvinyl alcohol for most purposes, and have the advantage of being rendered water-insoluble by simple treatment with acid. Such water-soluble polymers are compatible with viscose and can be used for preparing modified regenerated cellulose fibres. C. O. C.

Ultrasonics in the Manufacture of Rayon. J. A. Calhoun and American Viscose Corpn. *U.S.P.* 2,484,012.

By subjecting freshly formed highly plastic or gel-like fibres to ultrasonic radiation it is possible to exercise control over the various processes which occur before final setting of the fibres and to influence radically their molecular structure, with material improvement in their physical properties. Thus by subjecting partly regenerated cellulose fibres to longitudinal ultrasonic radiation, either in the spinning bath or soon after leaving it and while still acid-moist, the rate of diffusion of the acid through the fibres can be controlled so as to ensure uniform treatment.

U.S.P. 2,484,013.

Treatment of the liquors with ultrasonic radiation greatly accelerates the rate of settling out of impurities, the sediment being produced and a clear solution being obtained in seconds or minutes, as compared with the hours required for normal settling. C. O. C.

Ultrasonic Radiation in the Manufacture of Fibres from Organic Polymeric Fibre-forming Materials. L. E. Peterson, S. L. Dart, and American Viscose Corpn. *U.S.P.* 2,484,014.

A high degree of micellar orientation with respect to the fibre axis is obtained by subjecting the fibres at some time between extrusion and final setting to a beam of pulsating sound waves of not < 1000 cycles/sec., which is focussed in a definite predetermined direction on the path of the fibres. C. O. C.

Threads of Thermoplastic Cellulose Derivatives. Courtaulds Ltd., H. M. Avers, and J. Straw. *B.P.* 633,187.

High-tenacity threads of thermoplastic cellulose derivatives are produced by heating preformed threads to make them plastic and stretching them at least 50%. The threads are then allowed to shrink at least 8% while still plastic. J. W. B.

VII—DESIZING; SCOURING; CARBONISING; BLEACHING

Alkaline Scouring of Dry Spun Flax Yarns—Effect upon Physical Properties of Yarn and Fabric. H. L. Parsons. *J. Textile Inst.*, 40, T 424-T 444 (July 1949).

Detailed results are presented of an investigation into the change in physical properties, caused by alkaline boiling of varying severity, of dry-spun yarns of retted tow, retted line, and natural line flax, and of the differences in the properties of fabrics woven from boiled and unboiled yarns. W. K. R.

Detergents and Detergency. F. D. Snell. *Chem. and Ind.*, 539-545 (30th July 1949).

A review of the theoretical principles and the mechanisms of detergent action, in which the following subjects are discussed—detergent structure, natural and artificial soils, measurement of detergency, physico-chemical properties of detergent solutions, and detergent builders. W. K. R.

Detergency Studies. IV—Influence of Oily Soil upon the Removal of Pigment Soil. W. P. Utermohlen, Jr., E. K. Fischer, M. E. Ryan, and G. H. Campbell. *Text. Research J.*, 19, 489-496 (Aug. 1949).

Washing tests made on cotton soiled with lampblack or iron oxide in presence and absence of oily liquid and non-oily, water-soluble liquid binders show that ease of removal of the pigments was equal in all cases. Hence removal of solid soil and of oily soil are two separate processes. Reconsideration of the theory of soil removal appears desirable. P. C.

Bleaching of Cotton—A Proposed Continuous Hypochlorite Bleaching Process. L. P. Seyb and J. L. Foster. *Amer. Dyestuff Rep.*, 39, P 20-P 26 (9th Jan. 1950).

A continuous bleaching process is proposed and laboratory experiments to test it are described. Three major steps are involved—(a) Cotton goods are padded with sodium hypochlorite solution of strength 1-4 g. available chlorine per litre at pH 8-9, and allowed to steep for 30 min. (b) The material is thoroughly rinsed, saturated with 0.5-1.0% caustic soda, and steamed for 20-30 min. After rinsing, the treatment is repeated with 3-4% caustic soda. (c) The process described under (a) is repeated. The usual rinsing and finishing processes are then carried out. This process produces better whites and higher strength than those usually obtained with hypochlorite bleach methods. W. J. M.

Bleaching of Blue Cotton Fibre. R. E. Hudson, Jr., and H. M. Waddle. *Text. Research J.*, 19, 421-426 (July 1949).

PATENTS

Cellulose Bleaching. A. M. Dodson and Hercules Powder Co. U.S.P. 2,478,379.

When chlorinating cellulose in aqueous liquors at pH 1.0-4.5 there is less degradation, and variation in degradation with changes in the conditions of chlorination is minimised, if there is present 0.3-16.0% (expressed as NH_3 on the weight of the chlorine) of ammonia or salts of mono- or di-substituted ammonia. C. O. C.

Bleaching with Chlorites. R. M. Levy, J. E. Brennan, and Ecusta Paper Corp. U.S.P. 2,477,631.

Cellulosic textiles are bleached with an alkali or alkaline-earth metal chlorite, using as catalyst a little of a water-soluble Co, Ni, or Mn salt, the pH being maintained at 7-8. C. O. C.

VIII—DYEING

Helindon Dyestuffs for Wool. H. Luttringhaus, J. E. Flint, and A. A. Arcus. *Amer. Dyestuff Rep.*, 39, P 2-P 11 (9th Jan. 1950).

The Helindon dyestuffs dye wool satisfactorily at lower alkali concentration than the Indanthrene type. This is due to salt formation with the amino groups in the wool and their higher degree of dispersion at low alkali concentration. A microdiffusion method for estimating the relative particle size is described. Such dyeings result in dyed wool of superior quality to chrome-dyed wool.

W. J. M.

Experiments in Mineral Khaki—II and III. S. V. Bhende and S. R. Ramachandran. *J. Sci. Ind. Research (India)*, 7B, 176-183 (1948); 8B, (1), 10-16 (1949); *Chem. Abs.*, 44, 334 (10th Jan. 1950).

II—A study of the influence of the mode of formation of a mineral khaki on its hue and fastness to washing, perspiration, light, and rubbing.

III—The fastness to light, washing, and rubbing is due to formation in the fibre of insol. inorg. complexes of Fe and Cr. Fastness to perspiration is obtained by an after-treatment. C. O. C.

PATENTS

Dyeing Cotton with Dyes containing isoThiouonium Groups. K. Butterworth, E. J. Vickers, and I.C.I. Ltd. B.P. 633,602.

The cotton is dyed in a bath containing a carboxylic acid and a dye having at least one isothiouonium group, while an alkali-metal salt of a weak acid is gradually added, the dyeing being finally fixed by treatment in a sodium carbonate solution. C. O. C.

Dyeing Cellulose Acetate. Textron Inc. B.P. 633,717.

Cellulose acetate may be dyed with esters of leuco vat dyes by acidifying the dyebath with an inorganic acid, dyeing, and then developing with nitrous acid. C. O. C.

Iron Carbonyl as Mordant on Hydrophobic Fibres. General Aniline & Film Corp. and H. W. Grimmel. B.P. 631,765.

A carbonyl of a metal of the iron group is used as a mordant, particularly on hydrophobic fibres; e.g. acetate rayon is impregnated with an aqueous emulsion of iron carbonyl, and treated first with sodium hydrosulphite and then in an acid bath containing ω -oximino- ω -cyanoacetophenone, all the liquors being at 60-70°C. The lake-forming dyes containing nitro groups, e.g. C.I. 37, 41, 50, 58, 95, 101, 237, 674, 718, 720, 738, 765, 781, 785, 881, 883, 892, 896, 1027, 1031, 1033, 1035, 1040, and 1045, are particularly suitable for dyeing on an iron carbonyl mordant. C. O. C.

Dyeing Nylon with Afterchrome Dyes. D. N. Sharing and I.C.I. Ltd. B.P. 631,073.

Full colour value and very good fastness to washing are obtained if the dyeing and afterchroming are both done in acid solution, and then the dyeings are treated with a reducing agent. C. O. C.

Pigment Dyeing. Interchemical Corp. B.P. 631,882.

Even dyeings without migration and flocculation of the pigment on drying are obtained by applying a pigment dispersed in an aqueous solution of a water-soluble heat-precipitable alkyl cellulose, heating to precipitate the alkyl cellulose, and then drying. C. O. C.

Leather Dyeing. D. A. Plant and I.C.I. Ltd. B.P. 633,683.

Improved penetration and levelness are obtained on suede leather with acid dyes by applying them from a bath containing an ammonium salt and paraformaldehyde. C. O. C.

Azoic Dyes. S. A. de Matières Colorantes et Produits Chimiques Francolor. (IV, p. 299.)

IX—PRINTING

Suitability of Tragacanth as a Printing Thickener.

W. Jülicher. *Melliand Textilber.*, 31, 51-54 (Jan. 1950).

Various factors influence the suitability of tragacanth as a printing thickener. Tragacanth is sold in various qualities, shows unsatisfactory dilution curves, and is unstable to alkalis. The gel formed by the desiccated exudation from the plant is partly converted to the sol when boiled, and the process cannot be arrested by stopping boiling, as it continues at a slow rate even in cold solutions. As a result tragacanth thickenings tend to become thinner on standing. The ratio of gel : sol in the thickening decides the result of the printing process, the gel acting as dye carrier and the sol as distributor. B. K.

Short Aging Processes for the Printing of Synthetics, Silk, and Wool. A. K. Saville. *Amer. Dyestuff Rep.*, 38, P 310-P 312 (4th April 1949).

By using an assistant which acts as a dye solvent, so that when the aqueous portion of the paste has evaporated the dye is present in solution form and not as a pigment as in conventional printing, the time of steaming required to fix the print is reduced appreciably. Satisfactory solvents are diethylene glycol along with glycerol or urea. Examples are given of typical paste compositions for printing acetate dyes on acetate rayon and nylon, and acid and direct dyes on wool, silk, viscose rayon, and nylon, which may be fixed by 5-10 min. steaming in a rapid ager in place of cottage steaming for 1 hr. W. K. R.

PATENTS

Bentonite as Sole Thickener in Printing Pastes.

United Turkey Red Co. Ltd. and H. B. Hampson. B.P. 631,907.

Use of 10-20% by weight of bentonite as the only thickener in printing pastes gives better printing, improves the handle of the finished fabric, and effects economy in dyes. C. O. C.

Printing with Dyes containing Quaternary or Ternary Salt Groups. T. Chadderton, R. Thornton, and I.C.I. Ltd. B.P. 633,160.

Dyes containing one or more quaternary ammonium or ternary sulphonium or isothiouonium salt groups, each of which is directly attached to a methylene linkage itself directly attached to a C atom of an aromatic nucleus forming part of the final dye molecule, are used for printing textiles and paper. They are preferably applied in aqueous solution in presence of a mixture of a weak acid or acid salt and an alkaline salt of a weak acid which on steaming or heating changes from a weakly acidic to a weakly alkaline state. Use of these "onium" dyes renders it possible to obtain the high fastness of vat and azoic dyes by much simpler methods of operation than those required for printing vat and azoic dyes. C. O. C.

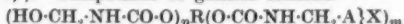
Printing with Sulphuric Esters of Leuco Vat Dyes.

A. Topham and I.C.I. Ltd. B.P. 633,536.

Organic compounds containing a sulpho group and a guanidino or substituted guanidino group, e.g. phenyl-guanidine-*p*-sulphonic acid, have a solubilising or dispersing action on the sulphuric esters of leuco vat dyes. By mixing them with those sulphuric esters of leuco vat dyes which give sparingly soluble alkali-metal or ammonium salts, much brighter and stronger prints are obtained than in their absence. C. O. C.

Pigment Printing Pastes. G. T. Douglas, A. Lowe, S. Robinson, W. Todd, and I.C.I. Ltd. B.P. 633,932.

Modification of B.P. 622,967 (cf. J.S.D.C., 66, 84 (Jan. 1950)). Compounds of general formula—



(R = an organic radical, A = an aliphatic or heterocyclic

tertiary amino group, X = an anion) can, when p and m are whole numbers, e.g. tristearin-11:11'-bis-(*N*-hydroxymethylcarbamate)-11'-carbamatomethylpyridinium chloride, wholly or partly replace the compounds of the previous specification; but when $p > 1$ and $m = 0$, e.g. tristearin 11:11'-bis-(*N*-hydroxymethylcarbamate), they can only partly replace them. C. O. C.

Photographic Printing on Fabric, Leather, Paper, Plastics, Furs, etc. L. R. Stewart. B.P. 633,634.

The material is impregnated with an ester of a leuco vat dye, exposed to light through a photographic negative so as to render the exposed portions of the dye insoluble in water, and washed to remove the remaining soluble dye; then the dye is developed as usual. The process can be made continuous, similar to roller printing, suitable machinery being described. C. O. C.

White Discharges on Dyeings aftertreated with Fixing Agents containing Copper Salts. J. R. Geigy A.-G. B.P. 633,445.

Modification of B.P. 616,950 (cf. J.S.D.C., 65, 315 (June 1949)). White discharges are obtained on metalliferous or metal-free dyeings which have been aftertreated with fixing agents containing copper salts, so that the copper is either ionisable or bound in a complex, by using a discharge paste containing a substance which yields cyanide ions, e.g. zinc cyanide, or by treating before or after a normal hydrosulphite discharge with a substance yielding cyanide ions. C. O. C.

Printing on Thermoplastic Sheet-like Material. M. A. Chavannes. U.S.P. 2,486,259.

The material is printed with an ink made up of a pigment, a thermoplastic binder, a plasticiser, and a liquid vehicle which does not attack the material being printed. The printed material is then heated to a temperature at which the material and the ink fuse together. C. O. C.

Printing Screens. A. C. Birtwistle, T. Chadderton, R. Thornton, and I.C.I. Ltd. B.P. 633,293.

More durable screens are obtained if an aqueous dispersion of polythene is incorporated in the photosensitive film used in their manufacture. C. O. C.

X—SIZING AND FINISHING

Urea as a Solvent Aid for Cellulose Textile Sizes. C. W. Tasker. Text. Research J., 19, 563-566 (Sept. 1949).

Urea was found not to be an economical solvent aid for alkali-soluble ethylene oxide ethers of cellulose which are suitable as textile sizes. Urea appears to act as an inert, highly compatible diluent, causing an apparent decrease in viscosity because of its high partial molal volume in aqueous solutions. The ratios of sodium hydroxide and cellulose ether to water appear to be the true governing factors in changing viscosity. P. C.

Modification of Fibre and Fabric Properties by Wrinkleproofing and Stabilising Agents. D. D. Gagliardi and A. C. Nussle. Amer. Dyestuff Rep., 39, P 12-P 19 (9th Jan. 1950).

The properties of cellulose fibres and fabrics may be altered by treatment with a large number of compounds whose action is to produce either chemical or physical cross-linking of the cellulose chains. This cross-linking reduces swelling, solubility, creep, and fibre extensibility; increases elastic recovery, wrinkle resistance, dimensional stability, and wet strength; alters dyeing properties; and gives fabrics a lower general toughness and resistance to wear and tear. These results are illustrated by a number of tables and graphs. The reduction in the various strength properties is due only to reduction of the extensibility by the resin and not to fibre degradation. Removal of the agent restores the original properties of the fabric. With the exception of the formaldehyde and glyoxal reactions, the polymerisation reaction may be reversed by mild acid hydrolysis. W. J. M.

Investigations of Anticrease Treatments for Cotton. R. F. Nickerson. Amer. Dyestuff Rep., 39, P 46-P 50, P 62 (23rd Jan. 1950).

The effect of the variables in the application of melamine-formaldehyde resins to cotton was studied. Crease resistance was always found to be accompanied by loss in breaking and tearing strength. It was concluded

that this was the result of increased brittleness of the fibres which the resin was believed to cross-link, and not an irreversible tendering action caused by the process. This was proved by removing the resin, when it was found that the original strength of the fabric was restored. Likewise it was shown that the mere presence of polymerised resin resulted in neither an increase in crease resistance nor a reduction in strength. The cross-linking, by ether formation, required anhydrous conditions, as might be expected. W. J. M.

Handle of Lower-grade Wool Cloths—Features of Successful Processing. Anon. Wool Record, 77, 579-583 (23rd Feb. 1950).

There are three main ways in which the handle of a fabric can be affected—(1) formation of surface cover, achieved by dry or wet raising, milling or stocking, and scouring; (2) penetration or working of the fabric, which includes softening and some gelatinisation of the fibres, obtained by blowing, crabbing, steaming, and scouring, and in dry finishing by blowing and damping; (3) producing a surface conducive to "slip", not generally a permanent feature of the cloth, which can be created by crabbing, blowing, and pressing. The application of these principles is discussed, stress being laid on the importance of allowing adequate time for each process and on careful and complete conditioning. C. O. C.

Shrinkage Control of Wool by Melamine Resins. I—Microscopical Observations. C. Maresch and G. L. Royer. Text. Research J., 19, 449-457 (Aug. 1949).

It is shown that, in wool fibres treated with methylated methylolmelamine resin, the resin is located at the scales of the fibres. The change in the directional coefficient of friction caused by deposition of resin at the scale interstices and the change in fibre elastic behaviour are believed to be the reasons for the modification in shrinkage properties. Elastic properties are considered to be changed chiefly by formation of a semi-rigid sheath around the elastic cortex. Fibre bonding is not to be discounted as a factor. P. C.

Shrinkage Control of Wool by Melamine Resins. II—Torsional Rigidity and Elastic Properties of Single Fibres. H. R. McCleary and G. L. Royer. Text. Research J., 19, 457-461 (Aug. 1949).

Treatment of wool fibres with a resin of the methylated methylolmelamine type has no effect on the work of extension but markedly increases the torsional rigidity. Repeated extensions of a treated fibre cause the torsional rigidity to fall. The conclusion is drawn that resin treatment affects only the surface portion of the fibres and that this modified structure is responsible for the improved shrink resistance of wool fabrics. The results are in agreement with the microscopical work in Part I (see above). P. C.

Foam Impregnation of Clothing. H. B. Smith. ORR 427/49* (PB 7242).

A qualitative and quantitative analysis of foam impregnation of fabrics has been made, and a graphical solution of general foam impregnation equations is given. It is concluded that foam impregnation is a thoroughly feasible process for impregnating fabrics with many proofing agents. C. O. C.

* Photocopies available from T.I.D.U., Board of Trade, Lacon House, Theobalds Road, London W.C.1, or (under PB No.) from Office of Technical Services, Department of Commerce, Washington D.C. U.S.A.—see J.S.D.C., 66, 53 (Jan. 1950).

PATENTS

Textile Materials. E. E. Weiss and United Merchants & Manufacturers Inc. U.S.P. 2,483,861.

Composite yarns, each having a core of continuous-filament thermoplastic material surrounded by a wrapper of staple fibres, are made into fabric and partly set in boiling water, while any permanent adhesion between the two components of the yarns is prevented. The fabric is then dyed, and setting of the fabric completed by impregnating with a thermosetting resin in presence of a catalyst. The products are dimensionally stable on repeated washings, have good wet and dry strength, and handle like fabrics made from all-staple fibre yarns. C. O. C.

Shrinkage Control of Cellulosic Fibres. L. Beer and Alroase Chemical Co. U.S.P. 2,484,545.

Natural and/or regenerated cellulosic fibres which may be mixed with not > 50% of cellulose esters of organic

acids are treated as either loose fibre, yarn, or fabric with a dilute aqueous solution containing glyoxal and a neutral water-soluble alkali-metal nitrate, chlorate, or perchlorate. After removal of surplus liquor the material is dried without tension and then cured at not $> 150^{\circ}\text{C}$. The materials must be freed from sizing or filling agents before impregnation. Fabrics wholly made of the treated fibres are dimensionally stable after repeated washings.

C. O. C.

Reducing the Creasing and Wrinkling Tendencies of Cellulosic Fabrics. M. Weisberg, A. S. Stevenson, L. Beer, and Alrose Chemical Co. *U.S.P.* 2,484,598.

Fabrics containing natural and/or regenerated cellulosic fibres and, if desired, protein fibres, either natural or man-made, are impregnated with an aqueous solution of a precondensate of a urea- or melamine-formaldehyde type of resin in absence of an acidic catalyst. The solution contains 100–300 g. of 90–100% resin per litre, and the goods should pick up their own dry weight of the liquor. After drying, the resin is cured by exposure to steam for not > 8 min. at $212\text{--}220^{\circ}\text{F}$. in an atmosphere consisting of an excess of steam-volatile organic acid.

C. O. C.

Treating Wool with Chlorine Compounds to reduce its Tendency to Felt. Wolsey Ltd., C. Earland, J. L. Bailey, and D. Carter. *B.P.* 631,141.

Wool, if desired in presence of other fibres, is treated with an aqueous solution containing one or more chloroamides or chlorosulphonamides which do not tend to yield chloroamines in cold acid solution. The solution has a chloride ion concentration not $> 0.3\text{N}$, and pH not > 2 . The wool is very evenly treated, and the abrasion resistance and bursting strength are hardly reduced.

C. O. C.

Reducing the Shrinkage and Felted Tendencies of Protein Textiles. M. Weisberg, A. S. Stevenson, L. Beer, and Alrose Chemical Co. *U.S.P.* 2,484,599.

Protein fibres, especially wool, either alone or mixed with cellulosic fibre, are impregnated, as either loose fibre, yarn, or fabric, with an aqueous solution of a precondensate of a urea- or melamine-formaldehyde resin or their ethers in absence of an acid catalyst. After drying, they are treated for 5–8 min. with steam at $212\text{--}220^{\circ}\text{F}$. in an atmosphere consisting of a steam-volatile organic acid.

C. O. C.

Diolefin-Nitrile Copolymer Bath for reducing the Felted Properties of Wool and other Protein Fibres. J. B. Rust and Montclair Research Corpn.

U.S.P. 2,484,962.

Wool is rendered non-felting without impairing its handle by treating it with an aqueous dispersion of the fully polymerised copolymer of 1:3-butadiene with 10–40% by weight of vinyl cyanide or an α -alkylacrylonitrile having a C_{1-4} alkyl group. The pH of the dispersion is < 7 and its strength such that 1–25% of the copolymer is deposited on the wool. The dispersion contains a non-cationic emulsifying agent and at least 25% on the weight of the copolymer of a water-soluble neutral salt.

C. O. C.

Continuously Neutralising Dry Acid Cloth. R. E. Derby and J. P. Stevens & Co. Inc. *U.S.P.* 2,485,710.

Cloth into which carbonising acid has been dried is passed through a chamber, to which gaseous ammonia and water vapour are continuously supplied in amounts sufficient to neutralise the acid in the cloth as it passes through the chamber. The dry neutral cloth leaving the chamber can go straight to dyeing or milling. Suitable apparatus is described.

C. O. C.

Increasing the Wear Resistance of Wool Fabrics. R. H. Doggett, A. R. Johnson, and Arthur D. Little Inc. *U.S.P.* 2,482,578.

At least 3% by weight of a compound of formula $\text{R}^1\text{X:C:Y}$ ($\text{R}^1 = \text{alkyl of } > 9\text{C}$; $\text{X} = \text{C or N}$; $\text{Y} = \text{O, S, or NR}^2$ ($\text{R}^2 = \text{H or a univalent hydrocarbon radical}$)), e.g. dodecyl isothiocyanate, is distributed over the surfaces of the wool fibres. The treatment does not affect the ability of the wool to absorb or release water vapour, and is suitable for papermakers' felts as it does not interfere very much with wetting of the treated wool.

C. O. C.

Waterproofing Textiles with Zirconyl Compounds. H. L. Van Mater and National Lead Co.

U.S.P. 2,482,816.

The material is impregnated with a solution of the zirconyl co-ordination salt of a fatty acid, e.g. an aqueous

solution of $(\text{CH}_3\text{COO})_2\text{ZrO}\cdot\text{H}_2\text{O}$ or an organic-solvent solution of $\text{C}_{17}\text{H}_{35}\text{COOZrO}\cdot\text{OH}$, and then dried at $40\text{--}100^{\circ}\text{C}$. so as to form an insoluble zirconyl salt, e.g. $\text{CH}_3\text{COOZrO}\cdot\text{OH}$, in the fibre.

C. O. C.

Alkylamidoalkyl Orthosilicates — Water-repellent Agents for Textiles. E. Zerner, M. Gradsztajn, and Sun Chemical Corpn. *U.S.P.* 2,477,779.

Textiles of all types are rendered water-repellent by treating them with a solution or emulsion of an alkylamidoalkyl orthosilicate, the acyl group of which contains 13–31 C (formed e.g. by treating stearamide with para-formaldehyde and SiCl_4) and then heating the impregnated material at 150°C . The finish is resistant to dry cleaning.

C. O. C.

Laundry-resistant Flameproofing of Cellulosic Materials. A. McLean, S. F. Marrian, and I.C.I. Ltd. *B.P.* 633,441.

The materials are impregnated with a polyethyleneimine and then treated with an aqueous solution containing one or more acid esters of orthophosphoric acid and inositol, pentaerythritol, or poly-pentaerythritol, in which all the OH groups are esterified by the phosphoric acid, and a quaternary ammonium compound containing at least one hydrocarbon radical having a chain of $> 8\text{C}$.

C. O. C.

Flameproofing. F. M. Ford, W. P. Hall, and Joseph Bancroft & Sons Co. *U.S.P.* 2,482,755.

Textiles of all types are given a flameproof, which is resistant to repeated washings and dry cleaning and which has little or no effect on handle or strength, by treating them with a strong acid, e.g. orthophosphoric acid, and a soluble organic nitrogenous base, e.g. urea. Thus cellulosic or proteinaceous textiles are impregnated with their own weight of a solution of dicyandiamide (50 parts), urea (113), guanidine carbonate (10.5), 75% orthophosphoric acid (75), and water (158), dried, then baked for 10 min. at 340°F ., and finally washed and dried.

U.S.P. 2,482,756.

A durable flameproof is imparted, with greatly reduced degradation and tendering of cellulose and protein materials, as well as great reduction in swelling and stiffening when the material becomes wet, compared with those hitherto associated with the use of a mixture of orthophosphoric or similar acid and urea or similar material, by adding to the mixture a volatile of decomposable alkaline agent, e.g. aqueous ammonia, to increase temporarily the pH of the mixture.

C. O. C.

Cellulosic Textiles protected against Mildew. F. J. Meyer and Dow Chemical Co. *U.S.P.* 2,486,961.

Incorporation of 1–5% of 2:4-dihydroxybenzophenone, and/or its mono- or dichloro derivatives and/or its 4-methyl or 5-methyl analogues, gives to cellulosic textiles increased resistance to mildew and minimises the loss of strength during weathering.

C. O. C.

Bonding Rubber to Cellulosic Fibres. E. A. Bried and Hercules Powder Co. *U.S.P.* 2,485,136.

Better anchorage of rubber to cellulosic fibres is obtained if the fibres are treated before applying the latex with an aqueous emulsion of a primary rosin amine or an aqueous solution of the acetate, hydrochloride, or hydrobromide of a primary rosin amine.

C. O. C.

Impregnated Flexible Fabric. H. Snow, J. D. Hill, and Southern Friction Materials Co. *U.S.P.* 2,484,756.

A woven fabric is impregnated with a thermosetting resin composition and then heat-cured. The hard, brittle surface crust of the impregnant is then removed by pressure-abrasion. This renders the impregnated fabric softer, smoother, and more flexible. The products are suitable as floor coverings, etc.

C. O. C.

Phenol-Aldehyde-Petroleum Pitch-Drying Oil Composition for Impregnating Woven Fabrics. H. Snow and Southern Friction Materials Co.

U.S.P. 2,485,327.

Material of high water and wear resistance, suitable e.g. for floor coverings, is obtained by impregnating a woven fabric with the following composition—an oil-soluble phenol-aldehyde resin which may be oil- or rosin ester-modified (1.5–2 parts), petroleum pitch composed of polymerised olefinic hydrocarbons of iodine number not < 200 and boiling range not $< 450^{\circ}\text{F}$. (3–4), drying oil (4–5.5), and petroleum distillate solvent (1–7.5).

C. O. C.

Coating Webs of Sheet Material. John Waldron Corp., and C. A. Dickaut. B.P. 633,950.

The coating material is applied to a part, or the whole, of the width of one side of the web, and is then spread on it by a doctor. The web is urged against the doctor by positive static fluid pressure uniformly applied to the non-coated side of the web. C. O. C.

Absorbent Fibrous Sheets. R. B. Seymour, G. M. Schroder, and Henry H. Frede & Co. U.S.P. 2,486,803.

An unwoven sheet of randomly distributed fibres, e.g. garnetted wool or cotton rags, is coated with a continuous film of a sodium salt of a carboxyalkyl derivative of cellulose, which is then rendered water-insoluble by heating at 300–450°F. The product is suitable for use as towelling, surgical dressings, etc.

U.S.P. 2,486,805.

The other side of a sheet produced by the above process is coated with a composition of 25–40 parts by weight of a solid polyethylene glycol of average mol. wt. 1000–7000 and 75–60 of a styrene-maleic anhydride interpolymers. This gives a product which after heating at 250–450°F. is smooth and water-repellent on one side yet highly water-absorbent on the other side, and which retains its strength even when wet.

U.S.P. 2,486,806.

The untreated sheet of fibres is coated with a mixture composed of 35–60 parts by weight of styrene-maleic anhydride copolymer and 65–40 of solid polyethylene glycol and then heated at 250–450°F. This coating effectively binds the fibres together, gives a good handle, and yet allows moisture to pass through it. C. O. C.

Coating Cellulosic Textiles with Maleic Anhydride-Styrene Copolymer and Solid Polyethylene Glycol. R. B. Seymour, G. M. Schroder, and Henry H. Frede & Co. U.S.P. 2,486,804.

An aqueous solution of 25–65 parts by weight of a solid polyethylene glycol of average mol. wt. 1000–7000 and 75–35 of a styrene-maleic anhydride copolymer, of mol. wt. such that a 0.2% aqueous solution has a viscosity of 0.5–50.0 centipoises, is used. After drying, the coating is heated to 250–450°F. to render it water-insoluble. The finished coating is highly flexible and applicable to textiles for clothing which may be laundered or dry-cleaned. C. O. C.

Patent Leather and Simulated Patent Leather. A. B. Harding and Monsanto Chemical Co. U.S.P. 2,485,967.

A resin-base coating is applied to a flexible fibrous backing, e.g. leather, fabric, or paper. A similar coating is applied to metal foil and then transferred to the coated backing by softening either or both coatings and pressing them together, this being done preferably by heat and pressure. The metal foil is then stripped off the coated backing, leaving a smooth finished surface of high gloss. C. O. C.

Hats from Knitted Yarn. Jones Brothers Pty. Ltd. B.P. 633,402.

Material knitted from any type of yarn is impregnated with the precondensate of a synthetic resin so that the dried yarn has pH 5–8. The material is then blocked to shape, after which the resin is cured. C. O. C.

Specificity of Microbiological Attack on Cellulose Derivatives. R. G. H. Siu, R. T. Darby, P. R. Burkholder, and E. S. Barghoorn. (VI, p. 302.)

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Adhesion [of Moistureproof Coating Compositions to Regenerated Cellulose Film]. C. R. Oswin. Trans. Plastics Inst., 18, 10–19 (Jan. 1950).

The use of plastics to obtain good adhesion under humid conditions is discussed. There are 63 references to patents. C. O. C.

Autoxidation of Alkali Cellulose. I—Experimental Study in the Kinetics of the Reaction. D. Entwistle, E. H. Cole, and N. S. Wooding. Text. Research J., 19, 527–546 (Sept. 1949).

PATENT

Sizing Paper. Monsanto Chemical Co., W. S. Wilson, and A. H. Bump. B.P. 633,332.

Sized paper is produced by mixing paper pulp with 0.25–4% on its weight of rosin or other size and 5–40% on the weight of size of a Diels-Alder reaction product obtained from an $\alpha\beta$ -unsaturated carboxylic acid or anhydride and a natural resin, terpene, or other natural substance containing a conjugated double-bond system in at least one tautomeric form. J. W. B.

Patent Leather and Simulated Patent Leather. A. B. Harding and Monsanto Chemical Co. (X, this page.)

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

PATENT

Finishing Leather or Leather Splits. B. F. Goodrich Co. B.P. 633,631.

A tough and abrasion-resistant finish is obtained by coating with an aqueous dispersion of a plasticised vinyl resin, drying, and then heating without pressure until the resin particles fuse to form a coherent film. C. O. C.

Patent Leather and Simulated Patent Leather. A. B. Harding and Monsanto Chemical Co. (X, this page.)

XIII—RUBBER; RESINS; PLASTICS

Adhesives for [Flexible] Plastics. L. E. Puddefoot and W. H. Swire. Trans. Plastics Inst., 18, 67–70 (Jan. 1950).

Adhesives for plasticised polyvinyl chloride and polythene are discussed. No suitable adhesive for the latter is known which supports the polarity theory of adhesion; one way out of the difficulty is to chlorinate its surface, which then becomes highly polar, so that many adhesives will stick firmly to it. C. O. C.

Some Further Uses of Maleic Anhydride in the Preparation of Synthetic Resinous Polymers. R. S. Robinson. Trans. Plastics Inst., 18, 20–29 (Jan. 1950).

Maleic anhydride is chiefly used to-day for producing oil-modified alkyd resins. After surveying previous work on the reaction resulting from the reactive double bond, it is shown that a distinct class of resinous polybasic acids is available from maleic anhydride and certain aldehydes and ketones. These acids can be esterified to produce polymeric esters of both the drying-oil-modified type useful in the surface-coating industry and unmodified types of the glyptal class useful in thermosetting moulding plastics. They can also be used in the proofing of textiles and paper. C. O. C.

Some Important Properties of Phenolic Resins. E. G. K. Pritchett. Trans. Plastics Inst., 18, 30–46 (Jan. 1950).

A review of the properties which allow phenolic resins to have so many and diverse applications, particularly their solubility, colour, curing, adhesion, and chemical, electrical, and mechanical properties. C. O. C.

PATENTS

Resin Compositions. British Industrial Plastics Ltd. B.P. 633,356.

Resin compositions suitable for coated, laminated, or moulded products consist of 95–75 parts by wt. of a non-alkylated amino-formaldehyde condensate and 5–25 parts of a modified alkyd resin prepared by treating a polycarboxylic acid with a polyhydric alcohol in presence of a modifying oil or fatty acid. J. W. B.

Surface Finishing of Plastic Sheets. W. H. Hickok and Girdler Corp. U.S.P. 2,485,238.

The sheet is brought into face-to-face contact with a caul of dielectric material whose surface texture corresponds with that desired for the sheet. The sheet and caul are then subjected to a high-frequency electrical field so as to heat them while they are pressing against each other. C. O. C.

Coatings from Vinyl Resin Dispersions. B. F. Goodrich Co. B.P. 633,630.

Homogeneous coatings or films are prepared by dipping the article to be coated in a latex of a vinyl resin, e.g.

polyvinyl chloride, containing plasticiser, filler, stabiliser, and/or pigment as desired, drying at the incipient softening temperature, and finally heating at the softening temperature to produce a non-porous film. E. C.

Floor Coverings containing Rubber. British Rubber Producers' Assocn. and C. M. Blow. B.P. 633,805.

The linocyn employed in linoleum manufacture is replaced by a masticated mixture of rubber and approximately an equal weight of softener, e.g. light mineral oil, together with the usual vulcanising ingredients and, if desired, resins, e.g. wood rosin, to improve adhesion to the fillers. The mixture is gelled by heating, e.g. for 2-3 hr. at 100°C., and is then processed by adding fillers, etc. as linocyn on conventional machinery. E. C.

Colloidal Melamine-Urea-Formaldehyde Copolymer Solutions. H. P. Wohnsiedler, W. M. Thomas, and American Cyanamid Co. (III, p. 297.)

XIV—ANALYSIS; TESTING; APPARATUS

Destruction of Organic Matter by Acid Ashing, with particular reference to the Use of Perchloric Acid in the Oxidation of Textile Materials.

A. G. Hamlin. *J. Textile Inst.*, 40, T 343-T 355 (June 1949).

Simple and safe procedures have been devised for the wet ashing of a wide range of textile materials, including wool, silk, rayons, nylon, and resin-, rubber-, and wax-proofed cotton, using mixtures of perchloric, nitric, and sulphuric acids. The method has been shown to be superior to wet ashing with sulphuric acid-nitric acid and sulphuric acid-hydrogen peroxide in speed and convenience, and to offer many advantages over dry ashing. The principles governing the safe use of perchloric acid are discussed. W. K. R.

Froth Flotation of Fibres. J. M. Preston and S. Saha. *J. Textile Inst.*, 40, T 381-T 388 (June 1949).

The froth flotation of textile fibres has been studied at various pH values, in the presence of various surface-active agents. Hydrophobic fibres, e.g. wool and Vinyon, float well, whilst hydrophilic fibres, e.g. cotton and viscose, have little tendency to float. Treatments which make the fibres more hydrophobic aid flotation, and *vice versa*. The flotation of most fibres is affected to a considerable extent by pH, and is also influenced by the dye present. Non-ionic wetting agents depress the flotation tendency of all fibres, and certain substances have a selective effect; thus phenol and cresol appreciably improve the flotation of wool. Procedures are given for the separation of various fibre mixtures by froth flotation. Quantitatively, these give results of the correct order, but are not quite so accurate as the conventional chemical methods where available. W. K. R.

Rapid Methods for Determining the Cuprammonium Fluidity of Cotton Cellulose. F. Howlett and (the late) D. Belward. *J. Textile Inst.*, 40, T 399-T 406 (July 1949).

Two methods are presented for the rapid determination of the cuprammonium fluidity of samples of wet cotton, such as taken during processing—(1) After rapidly drying by 3 washes in acetone followed by a current of hot air, an exactly 0.5% solution is prepared by hand shaking for 10 min. in a 2-oz. stoppered bottle, e.g. 0.25 g. of the dried sample with 50 ml. cuprammonium reagent, with the addition of 0.3 ml. of a solution of pyrogallol (50 g./100 ml. water). The solution is filtered into a viscometer, and the fluidity determined. Dissolution of the cellulose in cuprammonium occurs rapidly in the presence of air, and the pyrogallol inhibits degradation. (2) An approx. 0.25% solution is prepared by shaking a weighed quantity of the damp cotton with cuprammonium in the viscometer for 2 hr., and the fluidity determined. The moisture content is determined on a separate sample, and thence the concentration of dry cotton in the solution. A nomogram is given to convert the observed fluidity into fluidity at

0.5% concentration. The swollen condition of the damp cotton and the low concentration enable dissolution to be completed within 2 hr. Each method gives results which are in reasonably good agreement with those obtained by the standard method. W. K. R.

Solubility Number — A Measure of Cellulose Degradation. D. A. Derrett-Smith. *J. Textile Inst.*, T 622-T 627 (July 1949).

The "solubility number" test for assessing the quality of linen cellulose (Nodder, *J. Textile Inst.*, 22, T 416 (1931)) has been modified to obviate certain practical difficulties by doubling the ratio of 10-2 N-NaOH to weight of sample and by carrying out the test at 17.5°C. instead of 16°C. Each modification causes slightly lower results, but the solubility number obtained by the modified method multiplied by 1.16 is equivalent to the solubility number by the original method. W. K. R.

Estimation of Fatty Matters in Wool. E. W. Clark and W. L. Thomas. *J. Textile Inst.*, 40, T 356-T 370 (June 1949).

Soxhlet extraction of wool with a suitable solvent removes most of the wool fat esters, wool fat alcohols, free fatty acids, and added oil present; but some of the wool fat alcohols and a small amount of the esters are retained by the wool owing to an affinity between them and the soap residues. During the extraction some hydrolysis of the soap occurs, and the hydrolysed fatty acids along with a further small amount of entrained wool fat derivatives are extracted. Dry diethyl ether is considered to be the most suitable extraction solvent; petroleum ether (b.p. 40°-60°C.) gives lower results owing to non-extraction of oxidised fats, whilst acetone, dichloroethylene, and chloroform cause greater hydrolysis of the soap residues than diethyl ether and thus give high results. Subsequent extraction with absolute alcohol removes soap along with entrained wool fat derivatives; hydrolysis of the soap continues during the extraction, and the extract contains free fatty acids. Treatment with acid, followed by extraction with 85:35 ether-alcohol mixture removes insoluble soaps (in the form of fatty acids) and the last traces of wool fat derivatives. The commercial scour test, in which the loss of weight in scouring is determined, gives low results for fat content, because of incomplete removal of the fat and retention of soap by the wool, and it is suggested that this test should be replaced by a standardised diethyl ether extraction. W. K. R.

Wool Damage Data. K. S. La Fleur. *Text. Research J.*, 19, 497-504 (Aug. 1949).

Wool fabric was treated in a variety of ways to produce damage due to hydrolysis, reduction, oxidation, and incipient decomposition such as is caused by exposure to high temperatures or light in presence of air. Damage was assessed quantitatively by following loss of weight, area shrinkage, alkali solubility, water wettability, caustic soda wettability, and loss in tensile strength. The general conclusion is that the water wettability of wool may be useful for estimating degrees of damage to which many of the others are not sensitive. Area shrinkage is useful in following rupture of cystine linkages. P. C.

Quartermaster Corps Accelerated Test Method for Evaluating Shrink-resistant Wool. L. I. Weiner. *Amer. Dyestuff Rep.*, 38, 289-295 (4th April 1949).

An accelerated test, developed for evaluating the shrinkage characteristics of 10½-oz. wool shirting, comprises agitating the marked test pieces (24 × 24 in.) and ballast composed of detergent-free shrink-resisting wool fabric to make 6 lb. for 1 hr., in 4 in. water buffered to pH 5-7 (without any detergent) at 140°F. in a 24-in. diameter rotary reversing-type washing machine, after which the patterns are centrifugally extracted, tumbler-dried at 130°F. for 30 min., sprayed, pressed, conditioned, and measured. Results are reproducible and closely comparable with the cumulative effect of 20 washings in a U.S. Army mobile laundry. Maximum permitted shrinkages are—warp, 5% relaxation and 4% felting; weft, 4% relaxation and 3% felting. The variables in testing which affect the rate of shrinkage are discussed. W. K. R.

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